Vol. XVII, No. 5 DECEMBER, 1946

THE TOOL ENGINEER

OFFICIAL PUBLICATION OF THE ASTE AMERICAN SOCIETY OF TOOL ENGINEERS

Freedom's Christmas Gift . . . . . *by A. M. Sargent*

Photo Template System to Record Projects . . . . . *by Fred M. Burt*

Welding Fixtures for Mass Production . . . . . *by A. E. Rylander*

Homemade Presses for Plastics . . . . . *by Thomas A. Dickinson*

Practical Tool Inspection & Quality Control Methods . . . . *by D. P. Walsh*

Crushed Wheel Grinding . . . . . *by J. C. Wilson*

Tools and Statistical Quality Control . . . . . *by A. A. Goodman*

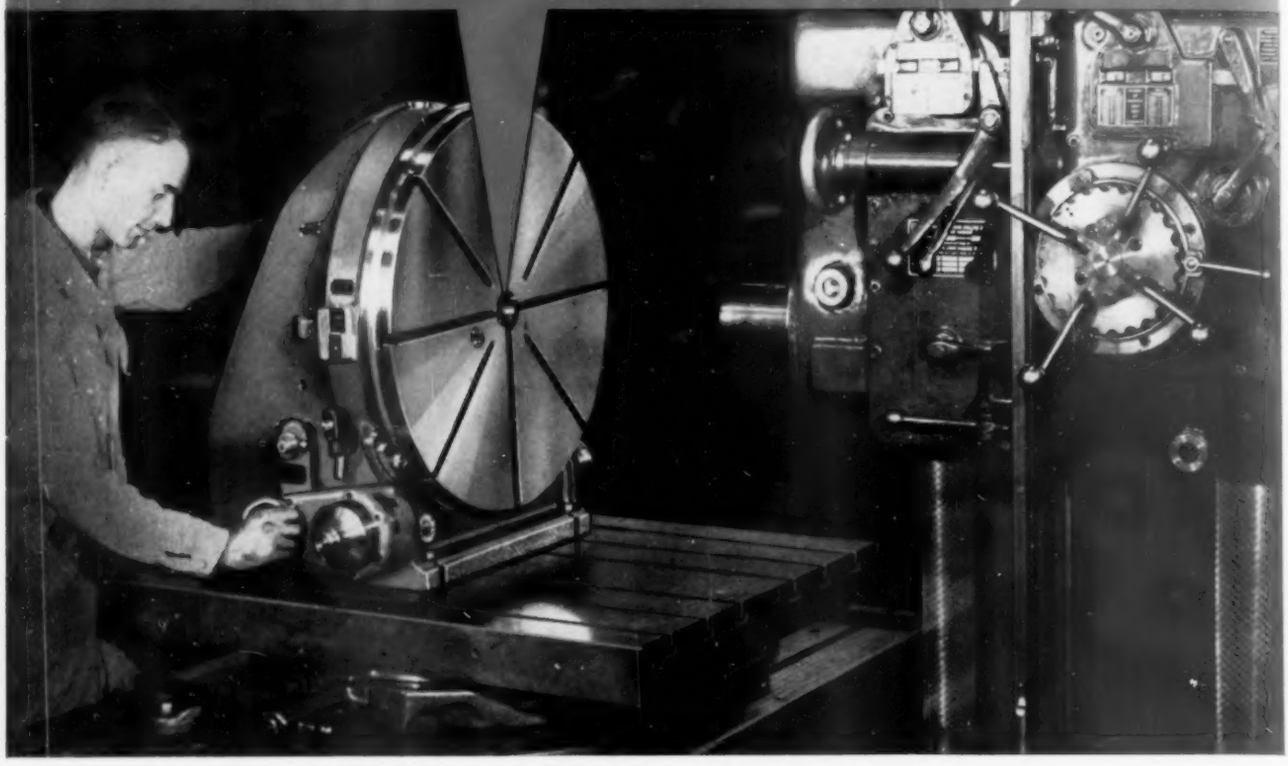
Application of Man-Au-Trol Spacer . . . . . *by Gunnar Skog*

Departments

A.S.T.E. News • Andygrams • Gadgets • Fundamentals of Tool Engineering • Good Reading • Bulletins • Tools of Today • North, East, West, South in Industry • Index to Advertisers

Behind every product that is mass produced is the tool engineer

UPRIGHT *Accuracy*



HIGH PRECISION ASSURED WITH P&W 30" VERTICAL ROTARY TABLE

Angular spacing to jig borer precision can be obtained . . . index and angle boring of any type can be handled efficiently and accurately—by using the 30" Precision Vertical Rotary Table on a horizontal boring mill. The Table is also ideal for inspection checking where accurate measurements are paramount in checking concentricity, index, or angle of parts.

The Table rotates 360° in a vertical plane and workpieces up to 30" in diameter can be mounted on it. It is a valuable addition to the well-equipped tool shop. Tool engineers recognize its high-precision accuracy and use it on innumerable indexing and checking jobs.

Complete information on the P&W 30" Precision Vertical Rotary Table will be furnished on request to your nearest Pratt & Whitney Branch Office.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT

Birmingham • Boston • Chicago • Cincinnati • Cleveland • Detroit • Los Angeles
New York • Philadelphia • Pittsburgh • Rochester • St. Louis • San Francisco

PUBLISHED MONTHLY BY

THE TOOL ENGINEER

AMERICAN SOCIETY OF TOOL ENGINEERS

Volume XVII **December, 1946** **Number 5**

Editorial

Robert B. Powers . . . . . *Executive Editor*
A. E. Rylander . . . . . *Technical Editor*
Fred W. Steiner . . . . . *Editorial Associate*
Doris B. Pratt . . . . *A.S.T.E. News Editor*
Nik Varkula . . . . . *Technical Art Director*

Advertising

Clarence T. Etter — *Advertising Mgr.*
B. B. Wellman — *Assistant Advertising Mgr.*

Editorial Committee

W. B. McClellan — *Chairman*
K. C. Jasper — *Vice-Chairman*
Foster C. Koehn — *Secretary*
Walter Kassebohm — John A. Lapham
Michael J. Radecki — H. L. Tigges

Officers

A. M. Sargent — *President*
W. B. Peirce — *First Vice-President*
I. F. Holland — *Second Vice-President*
R. B. Douglas — *Third Vice-President*
George C. Johnson — *Secretary*
V. H. Ericson — *Treasurer*
W. A. Dawson — *Assistant Secretary-Treasurer*
H. E. Conrad — *Executive Secretary*

Board of Directors

A. M. Sargent, *Chairman*

C. V. Briner — I. F. Holland
C. B. Cole — T. P. Orchard
H. E. Collins — W. B. Peirce
A. J. Denis — A. M. Schmit
R. B. Douglas — G. S. Wilcox, Jr.

TABLE OF CONTENTS

	Page
Editorial—Freedom's Christmas Gift . . *by A. M. Sargent*	17
Photo Template System to Record Projects . . . . . *by Fred M. Burt*	18
Welding Fixtures for Mass Production . . . . . *by A. E. Rylander*	21
Homemade Presses for Plastics . *by Thomas A. Dickinson*	28
Practical Tool Inspection and Quality Control Methods . . . . . *by D. P. Walsh*	29
Crushed Wheel Grinding . . . . . *by J. C. Wilson*	35
Tools and Statistical Quality Control Methods . . . . . *by A. A. Goodman*	40
What Price Airplanes? . . . . . *by A. M. Sargent*	44
Milling Attachments and Accessories . *by John E. Hyler*	46
Reviews and Previews . . . . . *by Fred W. Steiner*	50
Application of Man-Au-Trol Spacer . . . *by Gunnar Skog*	54

DEPARTMENTS

Andygrams	55
A.S.T.E. News	57
Fundamentals of Tool Engineering	75
Gadgets	77
Good Reading	78
Bulletins	79
North, East, West, South in Industry	80
Tools of Today	81
Index to Advertisers	158

American Society of Tool Engineers

National Headquarters

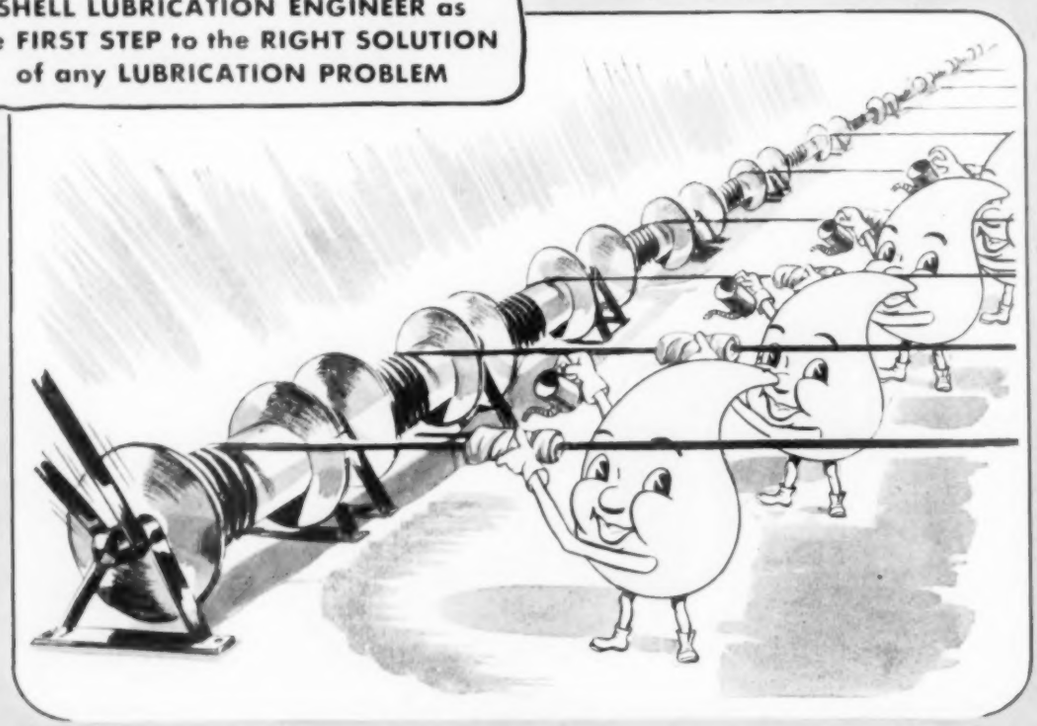
Phone: CHerry 8082
1666 Penobscot Bldg. Detroit 26, Michigan

The TOOL ENGINEER
Editorial and Advertising Offices:
Phone: TEmple 2-2560
1922 West Canfield Detroit 8, Michigan

The Tool Engineer is published monthly at 1666 Penobscot Building, Detroit 26, Michigan, in the interest of the members of the American Society of Tool Engineers. Advertising and Editorial departments are located at 1922 West Canfield, Detroit 8, Michigan. Subscription is $2.00 per year. Non-members $6.00 per year in the U.S.A., Canada $6.50 per year; all other foreign countries, $8.00 per year. Copyright 1946 by the American Society of Tool Engineers. Entered as second-class matter February 8, 1945, at the post office at Detroit, Michigan, under the Act of March, 1879.

= Call the

SHELL LUBRICATION ENGINEER as the FIRST STEP to the RIGHT SOLUTION of any LUBRICATION PROBLEM



SHELL RUST PREVENTIVE ... ELIMINATES GUMMING

PROBLEM: Steel wire, drawn to proper size for use by wire rope makers, was coated at steel mill for protection during shipment and storage. Use of a rust preventive was necessary, but rope makers complained that it gummed and clogged their wire rope machines.

SOLUTION: When the Shell Lubrication Engineer surveyed the problem he recommended a change to a Shell Ensis product. This gave complete protection, and the gumming problem disappeared. Moreover, Shell Ensis Fluid is a petroleum product ... dissolves harmlessly when the permanent lubricant is added to rope strands.

* * *

CONCLUSION: It pays to consult the Shell Lubrication Engineer, regardless of the nature or size of your lubricating problem. Write for a copy of Shell's 40-page booklet on Rust Prevention. Shell Oil Company, Incorporated, 50 West 50th Street, New York 20, New York; or 100 Bush Street, San Francisco 6, California.

SHELL RUST PREVENTIVES

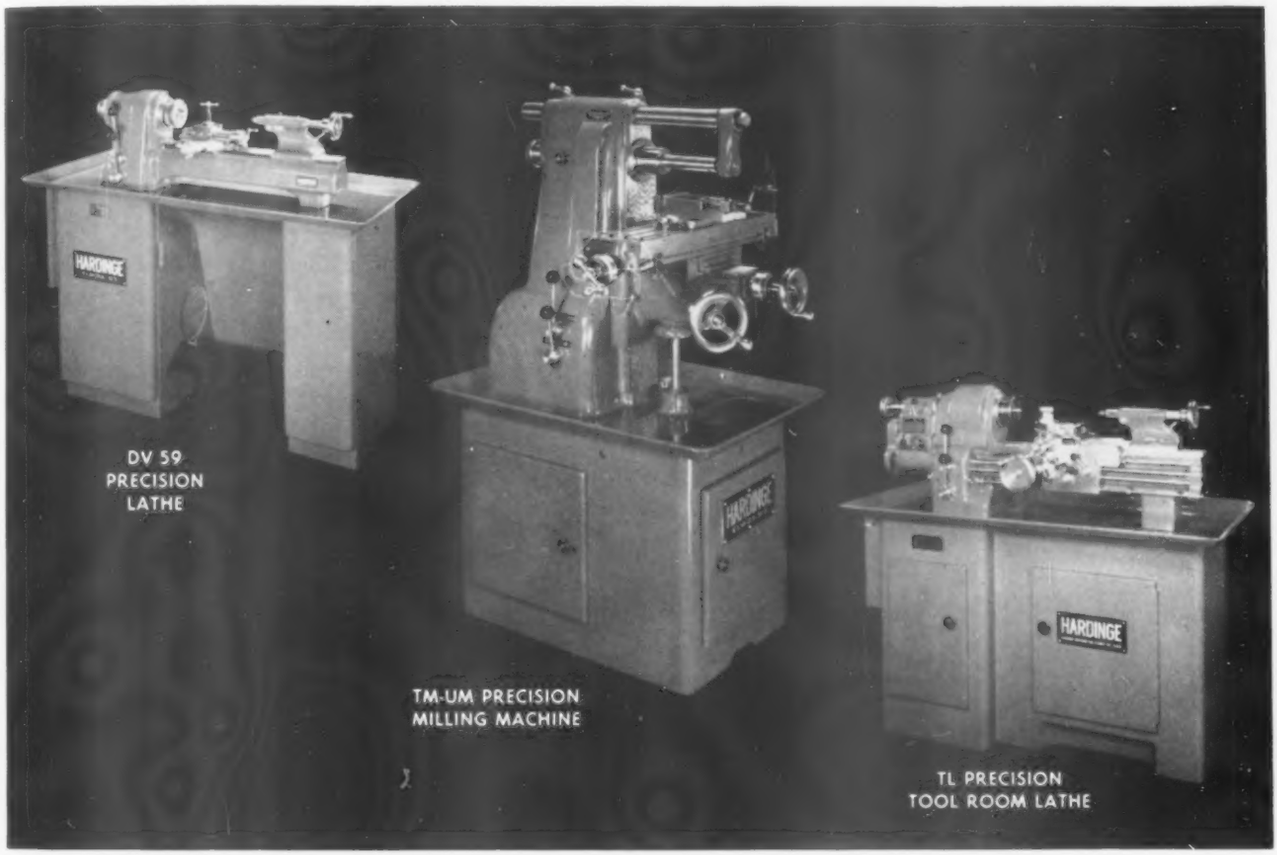
OILS ... FLUIDS ... COMPOUNDS

SHELL

HARDINGE
ELMIRA, N.Y.

MATCHED FOR PRECISION TOOL ROOM WORK

HARDINGE High Speed Precision Lathe
HARDINGE High Speed Precision Milling Machine
HARDINGE High Speed Precision Tool Room Lathe



Here are three machines that are specifically matched together to step up precision production in your tool room, laboratory and development departments—the HARDINGE High Speed Precision DV 59 Lathe, the HARDINGE High Speed Precision TM-UM Milling Machine, and the HARDINGE High Speed Precision TL Tool Room Lathe.

Now you can handle, with facility, the greater portion of your tool room type work with lower costs than when done on large, slow machines. Interchangeability of attachments among these Hardinge matched machines permits handling a variety of work with minimum expense. For example, all spindles take standard 5C HARDINGE 1" capacity collets, including the spiral or plain index centers for the milling machine.

Write for illustrated bulletins which give complete details.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Gaging WITHOUT CONTACT

At a Speed as Fast as Light!

Hot sheets or strips of metal or foil flying from the rolls; paper emerging in a never-ending sheet; or the plastic or rubber blanket flowing from a calender, may be checked instantly for thickness, and this thickness controlled during the process, by the Sheffield Measuray.

Temperature of the material to be checked and its speed of movement do not affect the accuracy of the thickness check. Proximity of gaging head to material is not important—it can be as much as a foot or more distant, depending upon the application. Amplification and sensitivity are available in excess of any known industrial requirements without sacrifice in speed, range, or dependability. For instance, it is possible to amplify one per cent of the thickness of the stock being checked to extend over the full scale range.

The Measuray may be mounted on a production machine, or it may be used at the bench to measure stationary objects, especially those whose surfaces might be marred by a contact gage, or those of such resiliency that the contact gage measurements are not practicable.

See the Measuray demonstrated at the Sheffield plant in Dayton. Bring samples of work to be checked to see for yourself the savings in material and time, elimination of losses in destructive testing, and the increase in uniform quality which the Sheffield Measuray can bring you.

If a visit is not convenient, write us for detailed information. For an early installation, ask for a survey to be made in your plant by Sheffield engineers—no obligation on your part.

Write to Department L

Real job security is only provided by plentiful incoming orders shipped at prices consumers can afford and want to pay . . . modern machine tools help make this possible.

2307

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

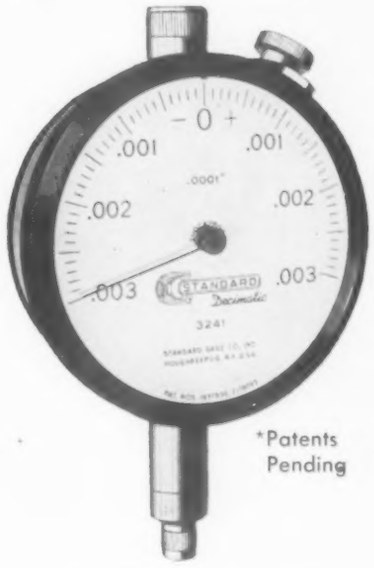
FOR DEPENDABILITY

Dial Indicators

REGULAR SERIES *Plus* *Decimatic** SERIES

AGD SPECIFICATIONS
THROUGHOUT

Made in 42 Models including 4 Dial Diameters, 7 Different Graduations, 90° Models (stem perpendicular to back), Long Range and Long Stem Types.



*Patents Pending

For Especially Fine Checking
EXTRA HIGH REPEATABILITY
MARKED IN DECIMALS
NO WHIP, NO WAVER OF HAND
AGD MOUNTING DIMENSIONS

Made in 19 Models including 4 Dial Diameters and 8 Different Graduations.

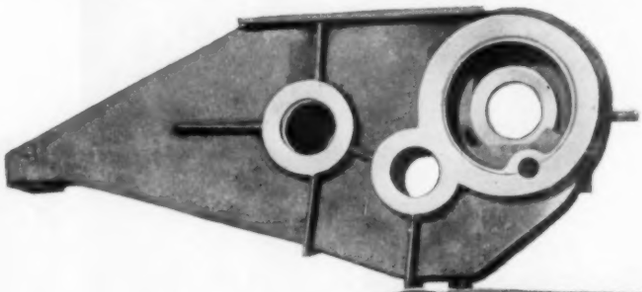
STANDARD SHOCKPROOF MECHANISM

Used in practically all models. Guards the instrument against sudden application of the work piece; assures long life and continuing accuracy. It is a **fully** shockproof mechanism which protects all delicate parts from stem to indicating hand.

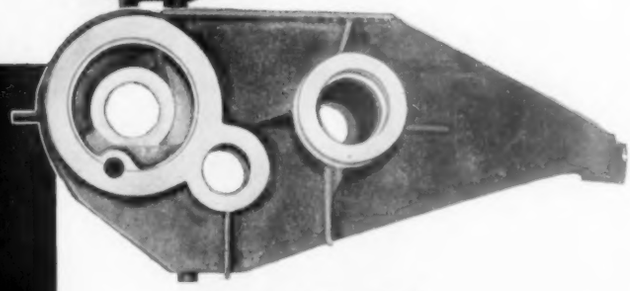
Write for Special Bulletin

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

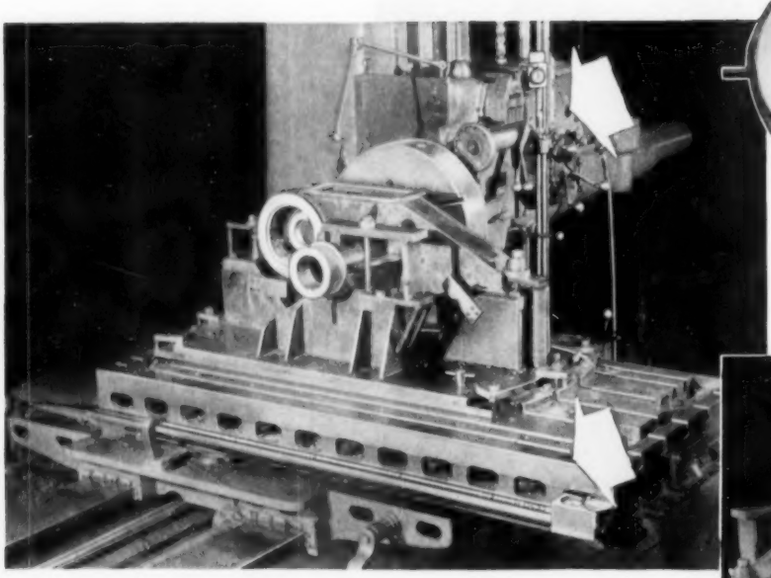
HOW *Center distances* ARE HELD TO



Photographs Courtesy Holm's Manufacturing Co., Kenosha, Wis.

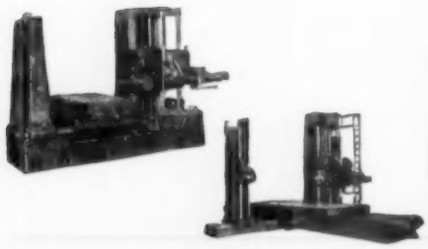


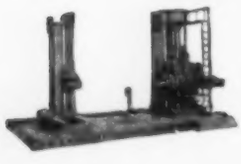
Gear case finish machined.



Precision end measures and dial indicators on the machine table and headstock are shown here. Center distances of the gear case trunnion have been determined and the end measures speed bore location.

Welded steel gear case being drilled after rough boring and facing operations. Machine spindle extends through the Continuous Feed Facing Head to drill this hole.





G&L Giddings

±.0004" ON A Standard G. & L.!

Machine Equipped with Dial Indicators and Precision End Measures *Eliminates* Work Layout and *Speeds Accurate Duplication of Machining Operations*

Bore center distances on this welded steel gear case are readily held to ± .0004" limits. The built-in accuracy of a standard Giddings & Lewis Horizontal Boring, Drilling and Milling Machine equipped with precision end measures and dial indicators makes it possible to hold this close tolerance.

End measures are laid in a V-type trough on the rear side of the machine table and are brought to register between a positive stop secured to the machine saddle and a dial indicator registering to .0001". After the end measures are adjusted to locate the correct center distances between bores, this adjustment is used for each successive part. Repetitive boring can be readily made and the same precision limits accurately held.

Precision Boring, Counterboring, Drilling, Turning and Facing Operations Performed in a Single Work Setting

Gear case production is further speeded by completing several different operations in one setting of the work. A Continuous Feed Facing Head is used to face the various bores and to turn the integral gear case trunnion. Performing these several operations in a single work setting on a G. & L. machine makes it unnecessary to move the part to other machines for individual operations.

When Your Machining Must Meet Accuracy Limits Equivalent To a Jig Borer

Precision machining to tolerances equal to those ordinarily obtained on a jig borer is possible with a Giddings & Lewis Horizontal Boring Machine when it is equipped with end measures and dial indicators. In addition, operations need not be limited to boring alone for the flexible G. & L. will BACK BORE, COUNTERBORE, TURN, FACE, DRILL, TAP, MILL and REAM on all types, sizes and shapes of work. Giddings & Lewis engineers are available to assist you in solving your precision machining problems — merely outline your needs — there is no obligation.

PRECISION END MEASURES . . .

Purpose and Applications

- To eliminate layout and simplify work set-up
- To insure more accurate work settings in shorter time
- To eliminate the use of toolmakers' buttons and other similar measuring devices
- To make accurate duplication of machining operations possible.
- For use in drilling and boring numerous holes in a work piece where center distances and alignments must be held
- For use when jig boring operations are performed on the horizontal boring machine

PERFORMANCE DATA AVAILABLE

FREE

Covering actual field cases showing G. & L. machines and attachments in use. Ask for Production Data Folder TE126.

G & Lewis MACHINE TOOL CO.

132 DOTY STREET • FOND DU LAC, WISCONSIN

Directory of A.S.T.E. Chapter Chairmen

AKRON CHAPTER, NO. 47
Second Thursday *
Clyde B. Mitchella, *Chairman*
1396 Hadden Circle,
Akron 2, Ohio

ATLANTA CHAPTER, NO. 61
Third Monday *
James C. Cogburn, Jr., *Chairman*
3311 Mathieson Dr., N.E.,
Atlanta, Ga.

BALTIMORE CHAPTER, NO. 13
First Wednesday *
W. Daryl Winger, *Chairman*
122 Greenridge Rd., Towson,
R.F.D. 8, Md.

BINGHAMTON CHAPTER, NO. 35
1st Wed. after 1st Mon.*
William S. Mazar, *Chairman*
P.O. Box 71, Chenango
Bridge, N. Y.

BOSTON CHAPTER, NO. 33
Second Thursday *
J. B. Savits, *Chairman*
28 Arnold Road, No. Quincy
71, Mass.

BUFFALO-NIAGARA FRONTIER CHAPTER, NO. 10
Second Wednesday *
Martin W. Kotarba, *Chairman*
1420 Byrd Ave., Niagara
Falls, N. Y.

CEDAR RAPIDS CHAPTER, NO. 71
Third Wednesday *
Michael J. Fitzgerald, *Chairman*
123 36th St. Drive, S.E.,
Cedar Rapids, Iowa

CENTRAL PENNSYLVANIA CHAPTER, NO. 22
Second Tuesday *
Walter G. Vernon, *Chairman*
401 W. Hillcrest Rd., Hillcrest,
York, Penna.

CHICAGO CHAPTER, NO. 5
First Monday *
Clare Bryan, *Chairman*
Link-Belt Co., 307 N. Michigan
Ave., Chicago 1, Ill.

CINCINNATI CHAPTER, NO. 21
Second Tuesday *
Lorin Hayden, *Chairman*
Modern Tool Co., 436 Commercial Square, Cincinnati, Ohio

CLEVELAND CHAPTER, NO. 3
Second Friday *
Rudolph E. Harrold, *Chairman*
1273 Burridge Ave.,
Mentor, Ohio

COLUMBUS CHAPTER, NO. 36
Second Wednesday *
Walter E. L. Bock, *Chairman*
323 Southwood Ave.,
Columbus 7, Ohio

DAYTON CHAPTER, NO. 18
Second Monday *
Adam Lensch, *Chairman*
29 Wroe Ave., Dayton 6, Ohio

DECATUR CHAPTER, NO. 58
Second Monday *
Cecil Elmer White, *Chairman*
1969 E. Clay St., Decatur 44,
Illinois

DETROIT CHAPTER, NO. 1
Second Thursday *
W. B. McClellan, *Chairman*
Gairing Tool Co., 478 Roosevelt
Sta., Detroit 32, Mich.

ELMIRA CHAPTER, NO. 24
First Monday *
Floyd B. Allen, *Chairman*
419 Balsam St., Elmira, N. Y.

ERIE CHAPTER, NO. 62
First Tuesday *
Harold W. Hagle, *Chairman*
3020 Woodlawn Ave.,
Wesleyville, Pa.

EVANSVILLE CHAPTER, NO. 73
Second Monday *
Howard C. McMillen, *Chairman*
Seeger-Sunbeam Corp.,
Evansville 7, Ind.

FAIRFIELD COUNTY CHAPTER, NO. 6
First Wednesday *
Charles J. Gluck, *Chairman*
21 Spring, Shelton, Conn.

FLINT CHAPTER, NO. 68
Third Thursday *
L. A. Kitchen, *Chairman*
600 E. Moore St., Flint 5,
Mich.

FOND DU LAC CHAPTER, NO. 45
Second Friday *
Leonard J. Kaufman, *Chairman*
2305 Wollmer St., Manitowoc,
Wis.

FORT WAYNE CHAPTER, NO. 56
Second Wednesday *
John G. Astrom, *Chairman*
1006 W. Wildwood Ave.,
Fort Wayne 6, Ind.

FOX RIVER VALLEY, NO. 72
First Tuesday *
H. J. Braun, *Chairman*
611 5th St., Aurora, Ill.

GOLDEN GATE CHAPTER, NO. 28
Third Wednesday *
Edward John Raves, *Chairman*
2100 Santa Clara Ave.,
Alameda, Calif.

HAMILTON CHAPTER, NO. 42
Second Friday *
John Neil Walton, *Chairman*
195 Main St. E.,
Hamilton, Ont.

HARTFORD CHAPTER, NO. 7
First Monday *
Edmond Morancey, *Chairman*
37 Kensington St.,
Manchester, Conn.

HOUSTON CHAPTER, NO. 29
Second Tuesday *
John C. Preston, *Chairman*
3113 No. Shepherd Drive,
Houston 8, Texas

INDIANAPOLIS CHAPTER, NO. 37
First Thursday *
David R. Smith, *Chairman*
2208 Park Ave. No. 2,
Indianapolis 5, Ind.

KANSAS CITY CHAPTER, NO. 57
First Wednesday *
Amber N. Brunson, *Chairman*
Brunson Instrument Co., 1405
Walnut, Kansas City 6, Mo.

LITTLE RHODY CHAPTER, NO. 53
Third Wednesday *
Arnold Chester White, *Chairman*
180 Morse Ave., Greenwood,
R. I.

LOS ANGELES CHAPTER, NO. 27
Second Thursday *
Anton Peck, *Chairman*
801 West 109th St.,
Los Angeles 44, Calif.

LOUISVILLE CHAPTER, NO. 54
Second Tuesday *
Ancil C. Brown, *Chairman*
1823 Alfresco Place,
Louisville 5, Ky.

MID-HUDSON CHAPTER, NO. 74
First Wednesday *
John L. Petz, *Chairman*
Nelson House,
Poughkeepsie, N. Y.

MILWAUKEE CHAPTER, NO. 4
Second Thursday *
Richard H. Ford, *Chairman*
R.D. 3, Box 525, Waukesha,
Wis.

MONTREAL CHAPTER, NO. 50
Second Wednesday *
W. F. Stewart, *Chairman*
4855 Harvard Ave., N. D. G.
Montreal, Quebec

MUNCIE CHAPTER, NO. 70
Second Wednesday *
William H. Vickers, *Chairman*
324 N. McKinley Ave.,
Muncie, Indiana

NASHVILLE CHAPTER, NO. 43
Third Friday *
Charles R. Oliver, *Chairman*
525 Heather Place,
Nashville, Tennessee

NEW HAVEN CHAPTER, NO. 41
Second Thursday *
Frank A. Shute, *Chairman*
Birchwood Drive, Orange, Conn.

NEW ORLEANS CHAPTER, NO. 60
Second Tuesday *
Edwin E. Graf, *Chairman*
6240 Pasteur Blvd.,
New Orleans 19, La.

NEW YORK, GREATER, CHAPTER, NO. 34
First Monday *
H. L. Horton, *Chairman*
Industrial Press, 148 Lafayette
St., New York 13, N. Y.

NIAGARA DISTRICT CHAPTER, NO. 65
Third Friday *
Evander G. Dewar, *Chairman*
130 George St.,
St. Catharines, Ont.

NORTH TEXAS CHAPTER, NO. 51
Last Friday *
Fred Bates, Jr., *Chairman*
4125 Locke, Ft. Worth 7,
Texas

NORTHERN NEW JERSEY CHAPTER, NO. 14
Second Tuesday *
John L. Webster, *Chairman*
964 Darien Terrace,
Teaneck, N. J.

PEORIA CHAPTER, NO. 31
First Tuesday *
C. B. Hartsock, *Chairman*
135 Cooper, Peoria 5, Ill.

PHILADELPHIA CHAPTER, NO. 15
Third Thursday *
Howard W. Gross, *Chairman*
Spring Garden Institute,
Broad & Spring Garden Sts.,
Philadelphia 23, Pa.

PHOENIX CHAPTER, NO. 67
Last Wednesday *
Harry E. Rives, *Chairman*
R.D. No. 1, Box 1187,
Phoenix, Ariz.

PITTSBURGH CHAPTER, NO. 8
First Friday *
William H. Schott, *Chairman*
1517 Graham Blvd.,
Pittsburgh 21, Penna.

PONTIAC CHAPTER, NO. 69
Third Thursday *
George F. Bryan, *Chairman*
73 N. Anderson St.,
Pontiac 20, Mich.

PORTLAND (MAINE) CHAPTER, NO. 46
Fourth Friday *
Merton C. Corson, *Chairman*
65 Evans St.,
South Portland 7, Maine

PORTLAND (OREGON) CHAPTER, NO. 63
Third Thursday *
Gerald E. Healy, *Chairman*
4002 N.E. 28th Ave.,
Portland 12, Ore.

POTOMAC CHAPTER, NO. 48
First Thursday *
Robert T. Plitt, *Chairman*
6110 39th Place,
Hyattsville, Md.

RACINE CHAPTER, NO. 2
First Monday *
Alfred P. Nelson, *Chairman*
3209 Victory Ave., Racine, Wis.

RICHMOND CHAPTER, NO. 66
Second Tuesday *
Jesse W. Johnson, *Chairman*
324 South Eight St.,
Richmond, Ind.

ROCHESTER CHAPTER, NO. 16
Second Wednesday *
Charles E. Seely, *Chairman*
2 Lake Crest Dr.,
East Rochester, N. Y.

ROCKFORD CHAPTER, NO. 12
First Thursday *
D. E. Hawkinson, *Chairman*
Greenlee Bros. & Co.,
12th St. & Columbia Ave.,
Rockford, Ill.

ST. LOUIS CHAPTER, NO. 17
First Thursday *
Jacob J. Demuth, *Chairman*
8007 Allen Ave.,
St. Louis Co. 14, Mo.

SAN DIEGO CHAPTER, NO. 44
Second Tuesday *
Paul H. Whitmoyer, *Chairman*
8864 Jefferson Ave.,
La Mesa, Calif.

SCHENECTADY CHAPTER, NO. 20
Second Thursday *
Delbert M. Schiele, *Chairman*
General Electric Co.,
1 River Rd.,
Schenectady 5, N. Y.

SEATTLE CHAPTER, NO. 39
Second Tuesday *
Kenneth Bergerson, *Chairman*
5018 6th N.E.,
Seattle 5, Wash.

SOUTH BEND CHAPTER, NO. 30
Second Tuesday *
Carl C. Stevason, *Chairman*
1760 Kessler Blvd.,
South Bend 16, Ind.

SPRINGFIELD (ILLINOIS) CHAPTER, NO. 64
First Tuesday *
Harry H. Washbond, *Chairman*
Baker Mfg. Co., 2316 S. 10th
St., Spr.ngfield, Ill.

SPRINGFIELD (MASS.) CHAPTER, NO. 32
Second Monday *
Charles H. Stonerod, *Chairman*
55 Field Road,
Longmeadow, Mass.

SYRACUSE CHAPTER, NO. 19
1st Tues. after 2nd Monday *
Raymond D. Coseo, *Chairman*
Crouse Hinds Co., Wolf at 7th.
No., Syracuse, N. Y.

TOLEDO CHAPTER, NO. 9
Second Wednesday *
Richard M. Hindman, *Chairman*
Doehler Jarvis Co., 2100
Smead Ave., Toledo, Ohio

TORONTO CHAPTER, NO. 26
Second Monday *
Walter W. Appleton, *Chairman*
56 Jackson Ave.,
Kingsway Park, Toronto, Ont.

TRI CITIES CHAPTER, NO. 23
First Monday *
Edwin A. Titus, *Chairman*
2221 Belle Ave.,
Davenport, Iowa

TWIN CITIES CHAPTER, NO. 11
First Wednesday *
John A. Harrington, *Chairman*
4920 Arden Ave.,
Minneapolis 10, Minn.

TWIN STATES CHAPTER, NO. 40
Second Wednesday *
William E. Farrell, *Chairman*
2 Pine St., Windsor, Vt.

WESTERN MICHIGAN CHAPTER, NO. 38
Second Monday *
James B. Brierley, *Chairman*
351 Indiana Ave., N.W.,
Grand Rapids 4, Mich.

WICHITA CHAPTER, NO. 52
Second Wednesday *
Roy W. Osburn, *Chairman*
1037 Marys Drive,
Wichita 12, Kansas

WILLIAMSPORT CHAPTER, NO. 49
Second Monday *
Jesse L. Strasburg, *Chairman*
715 Market St., So.,
Williamsport 32, Pa.

WINDSOR CHAPTER, NO. 55
Second Monday *
W. Bruce Moore, *Chairman*
46 Thompson Blvd.,
Riverside, Ont.

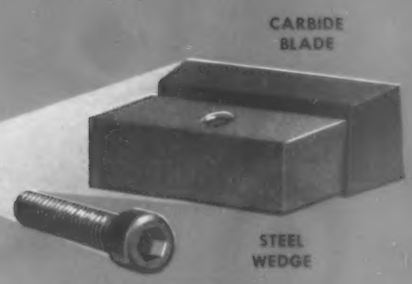
WORCESTER CHAPTER, NO. 25
First Tuesday *
Albert Thomas Warman, *Chairm'n*
130 Whitmarsh Ave.,
Worcester 6, Mass.

* CHAPTER MEETING NIGHT

AMAZING NEW MILLING EFFICIENCY!.... WITH SUPER SOLID CARBIDE INSERTED BLADE MILLING CUTTER

FACE MILLING — HALF-SIDE MILLING

CUTTER



- LONG LIFE
- HEAVY CUTS
- VERSATILE

BACK VIEW OF CUTTER

Specify SUPER Solid Carbide Inserted Blade Milling Cutters for extra machining efficiency and low tool cost. You get the outstanding economy of virgin Tungsten Carbide in these versatile cutters that machine *any* material.

Rugged SUPER design assures long tool life. Blades absorb shocks, and clamp screws are threaded into the steel wedge—not the body, eliminating possibility of damage to the body.

Non-slip wedges permit easy adjustment of blades for wear. The mechanically-held blade has an unusually long grind life—it is rugged and resistant to cracking and chipping. Blades are of large size proven more economical in tests.

Standard 6", 8", 10" and 12" cutters can be delivered quickly. Check for applications of this SUPER Solid Carbide Inserted Blade Milling Cutter at once! See our local representative or contact us direct.

GRINDING FIXTURES AVAILABLE FOR CAST IRON AND STEEL TYPE BLADES

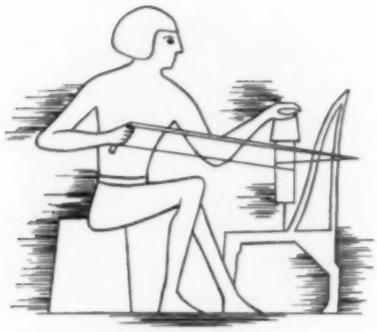
SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 5210 San Fernando Rd., Glendale 3, Cal.

"THE STORY OF THE TWIST DRILL IS THE STORY OF MORSE"

Aborigine with Shaft Drill



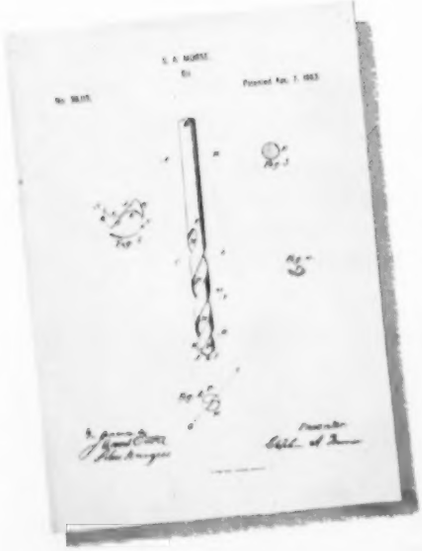
Egyptian with Bow Drill

Chinaman with Pump Drill

For Many Centuries They Drilled It the "HARD WAY" ...until

STEPHEN A. MORSE

Put his New Twist onto the old flat Drill



Signed and witnessed patent drawing of first Morse Twist Drill.

It was a long way from the aboriginal drill to the original Morse Twist Drill. All the way from a prehistoric cave to Bridgewater, Massachusetts . . . where Steve Morse patented his invention in 1863.

At first, all Morse Twist Drills were carbon steel, hand-cleared. Then high-speed steels were tried . . . *and forged* . . . and the Morse Drill won new users by the thousands. Meanwhile, groove-area and twist-cut angle were changed to step up speeds and feeds . . . and drills with oil-holes were developed for deep drilling. Next came cobalt steel drills for hard materials . . . drills tipped with tungsten carbide . . . and drills specially treated for abrasion resistance.

Then, as Morse development sped ahead, came standard and special drills for hard rubber, slate, plastics, brass, steel (including manganese) light metals, wood, paper. Today, whatever your drilling job, you can get exactly the Morse Twist Drill you need to do that job with highest speed and accuracy, at lowest cost. Ask your Industrial Supply Distributor, *now*, to get you a Morse specification . . . and count yourself in on all the benefits of Morse's steady advance in twist-drill development.

In only 83 years (from the time of the old flat drill) Morse development has ranged from the patenting of the milled twist drill to the modern, high-precision, long-lived High-Speed Drill.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

NEW YORK STORE: 130 LAFAYETTE ST. • CHICAGO STORE: 570 WEST RANDOLPH ST. • SAN FRANCISCO STORE: 1180 FOLSOM ST.

STARRETT HACKSAWS

THE NAME YOU LOOK FOR ON A "MIKE"

MEANS THE SAME QUALITY AND DEPENDABILITY ON

HACKSAWS AND BAND SAWS

TO GET THE MOST OUT OF METAL CUTTING

Starrett Hacksaw Booklet E describes the complete line of Starrett Hacksaw Blades for hand frame and hacksaw machine and Starrett Band Saws for cutting metal, wood and other materials. Starrett Cutting Chart instantly gives complete information for cutting any material by hacksaw or band saw. Write for copies.

Buy Through Your Distributor

THE L. S. STARRETT CO. · ATHOL · MASSACHUSETTS · U. S. A.

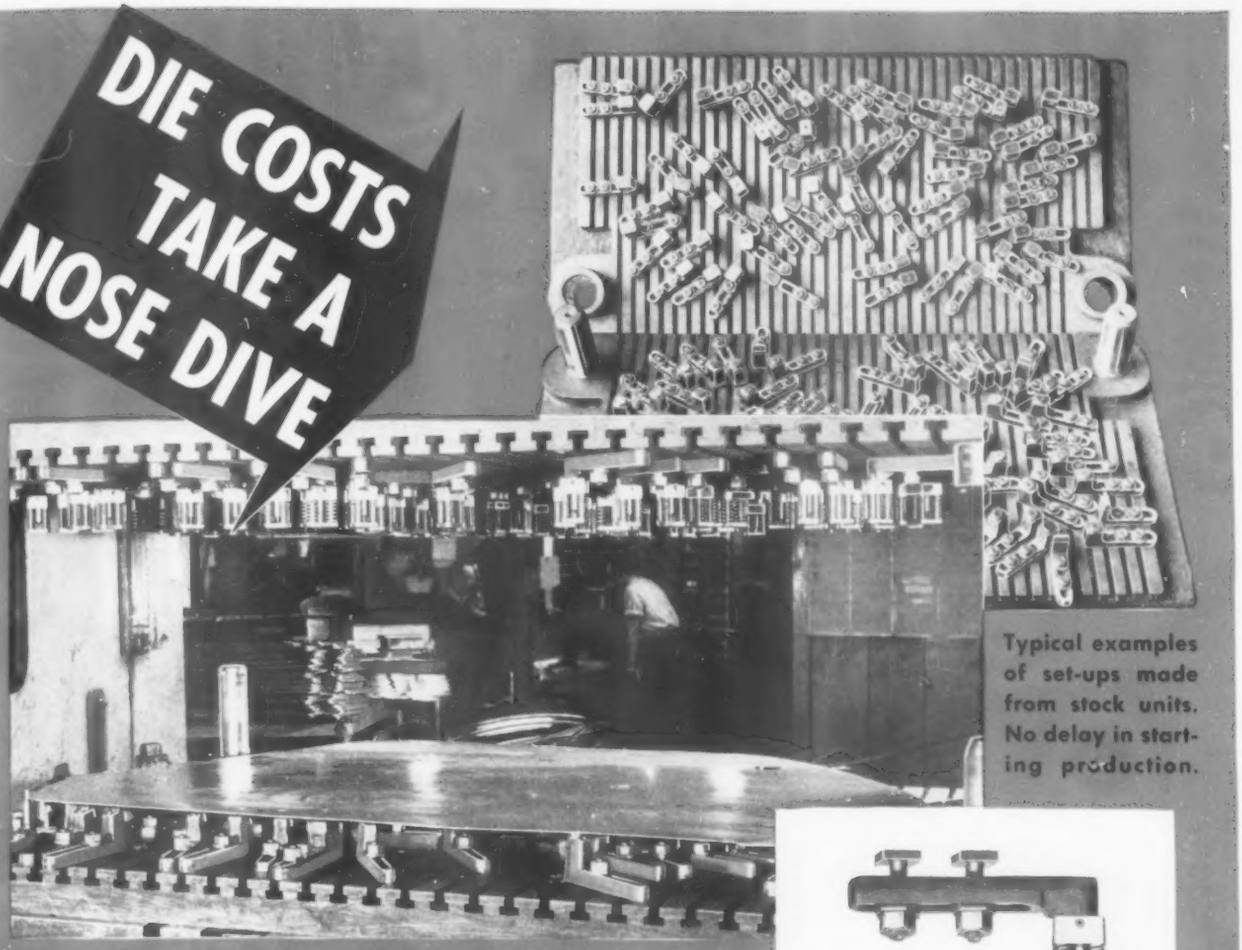
World's Greatest Toolmakers

STARRETT

PRECISION TOOLS • DIAL INDICATORS • STEEL TAPES • GROUND FLAT STOCK

HACKSAWS • BAND SAWS FOR CUTTING METAL, WOOD, PLASTICS

DIE COSTS TAKE A NOSE DIVE



Typical examples of set-ups made from stock units. No delay in starting production.

All there is to Whistler punch and die units.

WHISTLER Adjustable Perforating Dies Offer Added Production Economy

5-10-50 and even more different set-ups with the same dies? Impossible? Not when you use Whistler Multi-Use Adjustable Dies. For it's simple to rearrange these units . . . add or delete . . . get back into production within a few hours. Even so-called complicated arrangements are easy to set up. And, with first cost invariably less than for single purpose dies, this continued re-use of the same dies effects added economy in quickly writing off initial die investment. Over 750 prominent manufacturers have proven in their own plants that Whistler Adjustable Dies have sent costs into a nose dive.

No special tools are needed. Work in practically any size and type of press. Ordering now is particularly advantageous. Large stocks of standard diameter units from 1/32" up are available for overnight shipments. Notching, group dies and special shapes and sizes can be quickly made to order. Write today to:

WRITE FOR YOUR WHISTLER CATALOGS. Know the production advantages of Whistler Adjustable Dies.

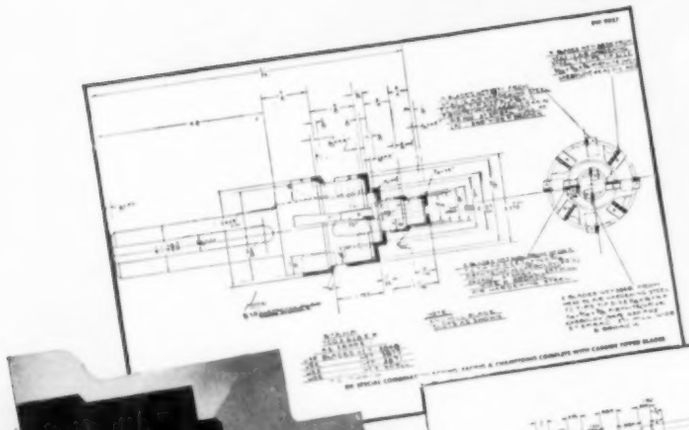
S. B. WHISTLER & SONS, Inc.

752-756 MILITARY ROAD BUFFALO 17, NEW YORK

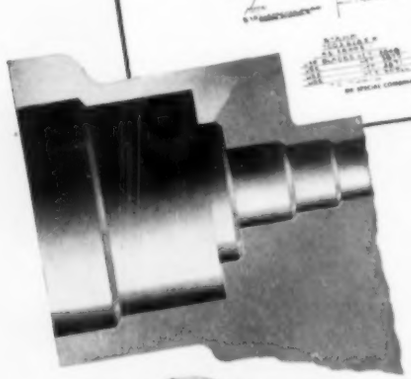
NEW BOOK of PRINTS shows

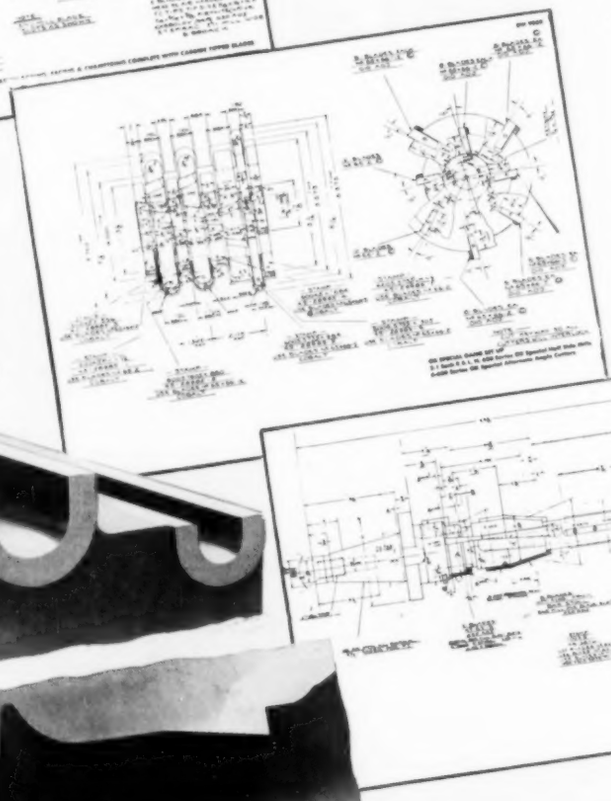
OK SPECIAL MILLING

Special Gang Cutters for Combination Milling, Boring,

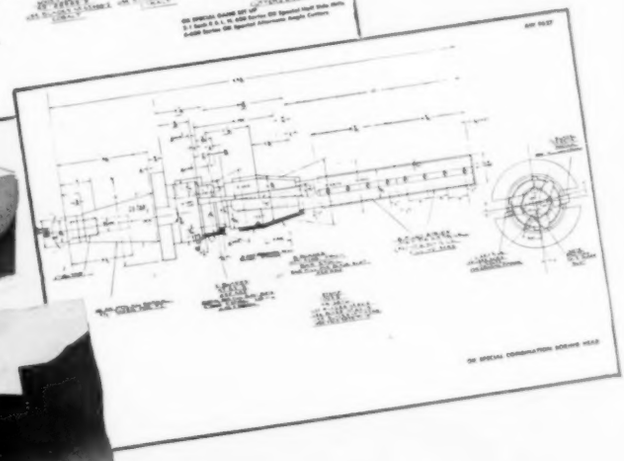


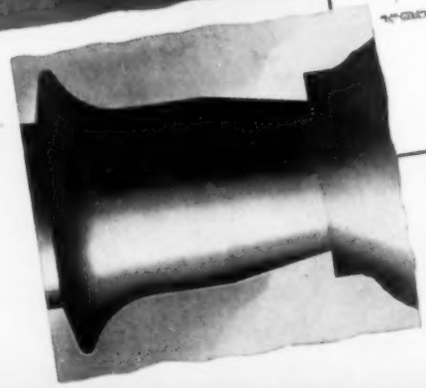
O K Special Combination Boring, Facing and Chamfering head with tungsten carbide tipped blades. Cored gray iron casting for a fuel pump housing. Simplicity of O K locking device lends itself to multiple blade combination tools.





O K Special Gang Form Mills combining alternate angle cutters with half side mills for machining round ways and top surfaces of a cast iron roll stand.





O K Special Piloted Combination Boring Head for taper boring, straight boring and spot facing — operations that require great rigidity for machining steel part.

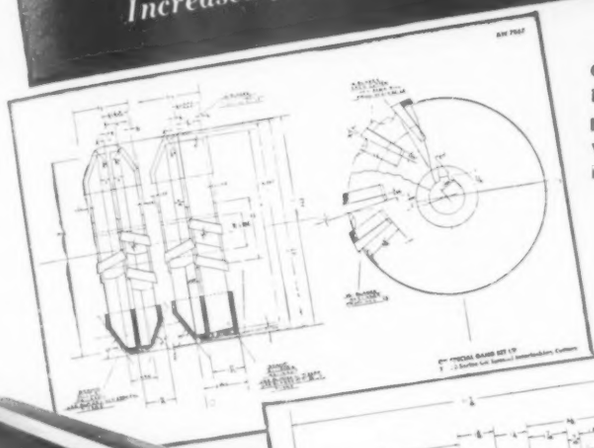
THE O K TOOL COMPANY, SHELTON, CONN.

America's No. One INSERTED BLADE METAL

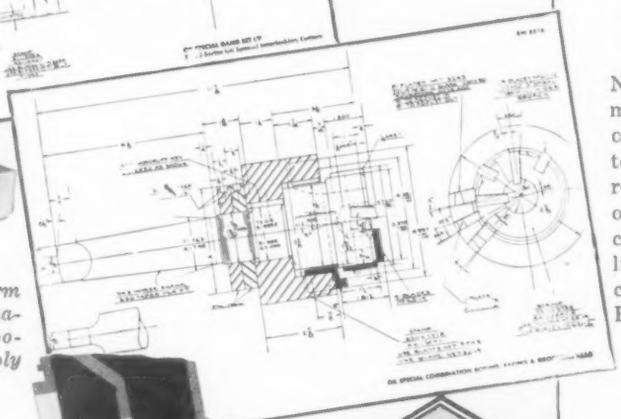
30 examples of...
and BORING JOBS

Facing and Chamfering

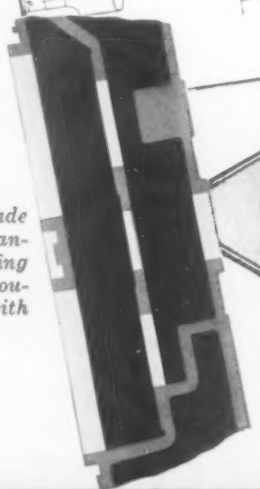
Complicated contours cut with one pass of special OK tools...
REMOVE MORE METAL PER MAN...PER MINUTE
Increased production – Inserted blades easily adjusted for wear



OK Blades are solidly locked in position without wedges, pins or shims.



O K Special Gang Form Milling Cutters for machining aircraft component part of chrome moly steel



O K Special Multiple Blade Boring, Facing and Trepanning Head for machining cored gray iron casting. Double operation performed with one combination tool.

Free

TO MACHINE TOOL BUILDERS

Manufacturers of turret lathes, shapers, planners, milling machines, boring mills, etc.

Now for the first time machine tool makers can get a comprehensive idea of the range and variety of special tools OK builds. This book of prints reveals how four, five and six distinct operations can be combined and executed with one pass of a tool. This limited edition available free to machine tool builders, is priced at $5. Page size 11 x 17 inches.

PIN THIS COUPON TO YOUR LETTERHEAD FOR A FREE COPY OF FIFTY PRINTS

OK

THE OK TOOL COMPANY
30 Hull Street
Shelton, Conn.

Name .....

Title .....

Firm .....

Address .....

ESTABLISHED 1901
DIVISION, AERODYNAMIC RESEARCH CORPORATION

CUTTING TOOLS

Here's something new!—A honey colored, odorless, low-cost base that can be blended with one or two mineral oils to handle all machining jobs wherever a cutting oil is used.

With QUAKER KUT 85, you do not need to stock many cutting oils and bases. QUAKER KUT 85 itself blended into various viscosities can handle every job in the plant from free machining stock to the toughest operations on stainless steel.

To simplify your oil storage and handling problem, all you need is some 100 Vis. and 250 Vis. oils which are normally stocked for other purposes. QUAKER KUT 85 can be blended with these in bulk storage tanks, at the oil reclamation tank, in a drum or right at the machine. No new equipment is needed.

You can make your own superior clear, transparent, odorless, effective cutting oil at a cost as low as 20 cents a gallon. Interesting—isn't it?

See for yourself what this or any other QUAKER product will do in your plant. The practical production experience of a local Quaker Process Engineer is available without cost or obligation.

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

Other Plants in CHICAGO and DETROIT · Warehouse Stocks in Principal Industrial Centers

A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Editorial

« Freedom's Christmas Gift »

ONE of the greatest Christmas gifts we ever received was given to us long before we were born. In fact, it was given to our ancestors 155 years ago and they have passed it down to us.

Little did our forebears realize, as they gathered around their Christmas feast in 1791, that just ten days before they had been endowed with a transcendent gift; one that had been bought with the blood of brave, unselfish men. It was a few simple words; but powerful enough to sustain the rights of men on this continent forever. These 45 words should be emblazed in the hearts and minds of all Americans and interpreted to the freedom-loving peoples of the world:

"Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof, or abridging the freedom of speech, or of the press; or the right of people peaceably to assemble and to petition the government for a redress of grievances."

Those are the abounding words of the First Amendment of the Constitution of the United States: irrevocable and uncompromising.

Only time has tested and shown that such a few inspired, common-sense words could mean so much to so many.

These words are being fortified today by the glowing faith of more than 140 million living Americans just as they were defended and strengthened by our men and women on many bloody battlefronts. They symbolize a way of life to you and me and millions like us. They are plain, fervent, living words and they will never die.

Our country's forefathers were thinking of you and me and our neighbors all over America when they wove these cherished words into the bulwark of freedom. They enacted into law a philosophy that will enrich the lives of our children's children and their descendants for all time.

Today, in the aftermath of our greatest struggle for freedom, thinking men of every nation are planning for World Peace. The same moving force that has been made to live by this 45-word gift to us can bring the light and joy of peace and security to all peoples. This gift should be shared with all men, everywhere . . . for written into it are the fundamental principles that are the very soul of international happiness.

By deed and example, by tolerance toward our fellow men, let's share it with our neighbors scattered over One World.

Ann Sargent

President 1946-47

By Fred M. Burt

Photo Template System to Record Projects

Production Templates by Aircraft Builders Based on Lofting Techniques of Yesteryear

GIANT LENSES, which can reduce laborious hand-worked reproduction projects to tasks requiring only seconds, are being used daily to reproduce the aircraft templates turned out at Northrop Aircraft, Inc., in Hawthorne, California, home of the Flying Wing. Here, template reproduction work, virtually impossible under old systems, has been carried on since the photo template department was installed.

Mr. Burt

In a nest of huge cameras, where the largest is an eight foot tall giant with a lens as large as a saucer, negatives are made of the original templates, ranging from 12" x 18" to 5' x 10'. Technicians control these big cameras, one of which is focused by an overhead rail travel system to tolerances as fine as plus or minus .001".

This pictorial article, by Mr. Burt, may be termed a sequel to "Tooling for Peace," by Nils H. Lou in December, 1945, *The Tool Engineer*. While Mr. Burt has been somewhat sparing, in verbal portrayal, the series of photographs will convey a very clear idea of the methods and equipment employed in photo lofting. It is one of the many war developed techniques which is destined to find wide application throughout industry.

The Editors

FIG. 1. The demand for speeded production, during the war, was instrumental in the development of this modern way of reproducing metal patterns for aircraft parts. A precision machine, this camera is capable of holding to plus or minus nothing tolerance. Jerry O'Ryen illustrates size and magnitude of "Big Bertha." Equipment is costly but pays dividends in speed and precision.

FIG. 2. The first step in template making is lofting the "master." Usually taken from engineering layouts, this pattern is a system of lines illustrating curves of aircraft sections. Modern streamlining makes accurate template work more necessary than ever before. Above, Joe Houston scribes master lines on metal sheet.

FIG. 3. Next step finds Don Bender and Jack West hanging completed master on vacuum board in preparation for reproducing shooting. Note overhead rail focusing system. Camera lens and bellows are at right. Vacuum grip on master prevents wrinkling and distortion.

FIG. 4. John Prsha adjusts the camera's vernier scale for exact reproduction. Readings are in terms of thousandths of an inch. Note rear view of vacuum board. Board may be activated in sections, thereby handling both small and large sections for reproduction. Range is from 12" x 18" to 5' x 10'.

The process of reproducing aircraft templates by photo camera received its initial development at the Glenn L. Martin Company in 1939 and 1940, when the fast approaching war made it imperative that the older and slower methods of handscribing for reproductions give way to faster and more accurate methods.

Northrop, at the time of completion of its bomber plant, installed the photo template section under the direction of Roy Wolford. Not only has it been of enormous value in developing the huge Flying Wing (which cost about $13,000,000), but it is also of inestimable worth in keeping permanent records. Peacetime aircraft production, will, of

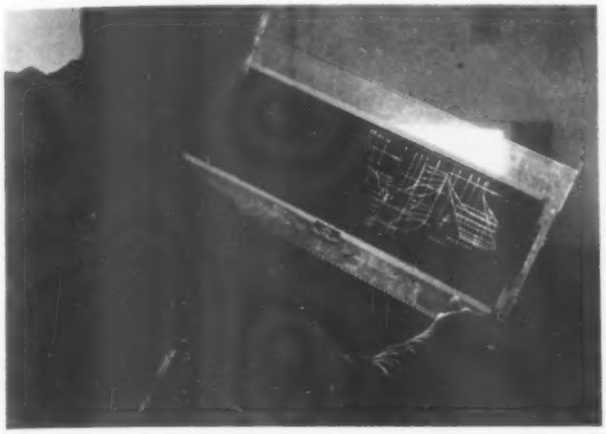


FIG. 5. The lens has been clicked and now we have the negative, reduced five times, on glass. Template Technician, John Prsha, is studying progress of development. This negative constitutes permanent safe record of master, which will be vault-filed for safekeeping.

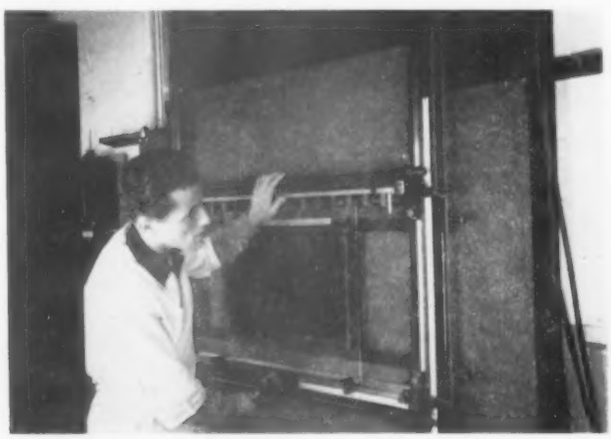
FIG. 8. Sensitizing—by the spray method. With an ordinary paint "gun," Don Bender sprays sensitizing emulsion on the steel copy metal —a substance that has light reacting properties. Areas of light and darkness on the negative produce lines of master.

FIG. 6. Retouching. Clerk, Maybelle Blair, is here removing light specks from negative. This is common practice in photography and follows procedures used in portrait development.

FIG. 9. The negative vault. On orders from Engineering or Production, Maybelle Blair selects negative to reduce template required for aircraft part or section. Five times reduction makes storage problem simple.

FIG. 7. Next, we have the shop template. Otto Maier and Jack West are shown cutting to size a sheet of .040" thick steel in preparation for shooting copies of the master. Modern machine methods of cutting assist in making perfect copies.

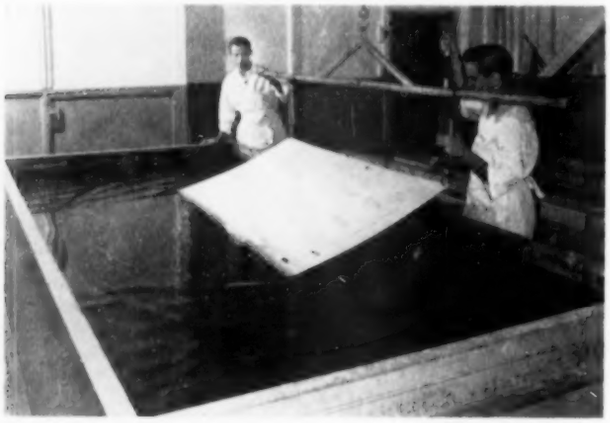
FIG. 10. John Prsha positions the negative back in the same camera shown in Fig. 1 in this series. The negative image will be projected back up to original size.



course, use this technique extensively, but even more important to manufacturers and engineers, in other industries, is another idea—that is, to make use of this technique for a wide variety of other applications, none of which have as yet been considered. The sequence of photographs, with their captions, should give a proper understanding of the workings of the system.

One typical job was the complete making of templates for the entire wings of the Northrop controlled missile, the Army JB 10, in the brief span of 23 hours. By the old method, this work would have required the services of two men for approximately three weeks. Some reproductions that the equipment is called upon to do, specify one twentieth reduction from the original master, maintaining practically plus or minus zero tolerances. Negatives taken of the master templates are normally reduced five times to facilitate storage.

FIG. 11. Copy metal, "shot" with image of the negative by Maier and West, is here being developed. The process is simple, light areas—or lines on negative—allowing light to strike sensitized metal. The light struck areas turn black on copy.



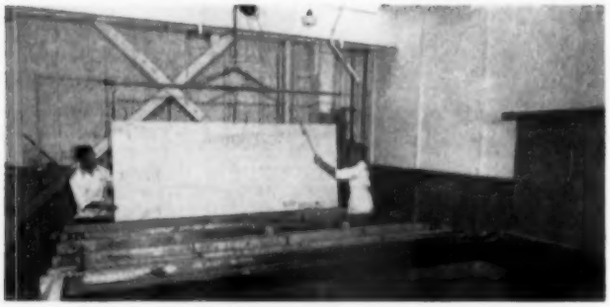
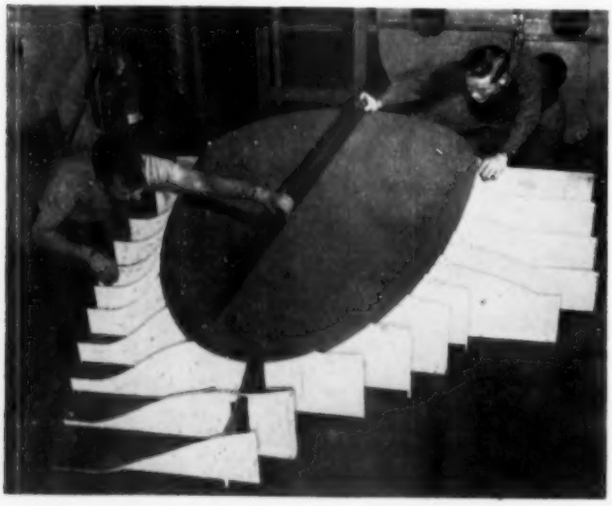


FIG. 12. The last step for the photo template men. West and Maier wash the copy in clean water and hang it up to dry.

FIG. 13. Building an airplane. Template has been sawed along the lofting curves and the different sections now present the curves of a section of the plane. From these matched curves, plaster patterns are made for die and press shops. Practically the entire aircraft is built from templates.



When a production template is required, it is a simple procedure to take the negative out of storage and reproduce all or any part of it to full scale, for the shop. In like manner, should an exact scale model—or the reduced or enlarged size of a structure—be required, the template camera facilities will exactly reduce or enlarge master patterns to any scale. This eliminates the guesswork inherent in such procedures.

The principle of template making can be traced to the shipbuilding industry. It is a heritage handed down from the era (1812-1856) of American clipper ships constructed in New England shipyards and which blazed a path in the early commerce and naval warfare of the United States. From master marine architects came the "lofting" idea: the laying out of full scale drawings of intricate forms and ship parts on the floor of a large room or loft. However, photo template making is strictly a World War II aircraft development. And, like so many other aircraft and shipbuilding developments, the advantages that might be derived therefrom should be made cognizant to, and adopted by, any other industries where the use may be at all practical.

Of course, such equipment is expensive, and some companies that might have use for such facilities, or that might develop such a need, might not be justified in making the outlay. In such a case, they might be able to turn to one of the aircraft or other companies, scattered over the United States, who have such equipment, since it is quite certain that none of it is kept in constant use by the owning company.

One for the Bonepile

Congressional investigators—and others—who believed that War Assets Administration (the Government agency charged with the disposal of billions of dollars worth of surplus goods) had a skeleton or two in the closet, were right.

Recently WAA received a declaration of surplus items for Sheppard Field, Texas, which included two "adult skeletons, human, articulated: with metal cabinet." Costing the government $150 each, they were sold to Texas schools for $72.50 each.

Lubricant for Die Casting

A NEW LUBRICANT for pressure die casting dies—called Die Slick No. 11—has been developed by G. W. Smith & Sons, Inc., 5401 Kemp Rd., Dayton 3, Ohio, specialists in the manufacture of lubricants and supplies for the die casting industry.

Die Slick No. 11 is claimed to be not only an excellent lubricant, but also guarantees a clean, spotless zinc casting with a satin-smooth surface finish. It is a colorless, odorless, non-staining compound, non-corrosive and non-carbon-forming, and causes no objectionable smoke or gases. Just a fine mist spray of the lubricant, applied to the die, eliminates scoring and sticking. It further prevents formation of zinc oxide on the core pins and die cavities, and assures easy ejection of the casting. An important feature, claimed, is that it leaves no undesirable deposit on the casting that might prove detrimental to subsequent plating of the zinc casting.

By A. E. Rylander

Welding Fixtures for Mass Production*

Simple Fixtures and Straight Line Flow of Materials Result In Ease of Operation and a Very High Production Potential

Mr. Rylander

UNDER PRESENT-DAY conditions, it is not enough to design fixtures that will work and which will duplicate parts or assemblies *ad infinitum*. Rather, the fullest consideration must be given to speed of operation and ease of manipulation, the latter an essential consideration in that it implies operator convenience. In the past, too little attention has been paid to operator convenience; today, it is one of the "musts" in tool engineering since, by reducing operator fatigue, one may expect an appreciable increase in output. The tired worker is a liability on the production line.

Fixtures, whether for welding or other processes, should be designed for easy loading and unloading, and for easy and rapid clamping, to the end that the greater part of the working time, from load to unload, be devoted to actual processing. Obviously, idle or non-productive time must be held to a minimum.

Fullest consideration must also be given to material handling, for whether a part be small or large, light or heavy, it must nevertheless be continuously handled from the time that processing starts until the finished product is shipped. And even that is not the end of handling, however the responsibility of tool engineers and production executives is supposed to end at the door of the shipping room.

Material handling, in turn, brings up the consideration of plant layout, an item of perhaps somewhat lesser concern in the case of small parts, but very important in the manufacture of large or cumbersome structures. For, if equipment is poorly disposed, thereby entailing an inordinate amount of trucking and crane lifting—the latter with its "leapfrogging" and consequent hazard to workers—there may be created bottlenecks that would entirely cancel out the efficiency of even the most carefully considered machines and fixtures.

**Note: This paper was originally scheduled for the A.S.T.E. Semi-Annual Meeting, Pittsburgh. It was subsequently presented before Detroit Chapter, A.S.T.E.*

The ideal production setup for welding, then, may be summed up as follows: (1) A choice of fixtures that embody precision (for duplication and control of quality), ease of operation and a high productive potential; (2) a well considered plan for material handling, to insure an easy, uninterrupted flow of material in process—preferably straight line—from fixture to fixture or from station to station; (3) an equally well considered plant layout, with thought to ample working space for each operator and adequate aisle space for easy trucking. Thought must also be given to disposition of welding equipment and accessories, and to generators and transformers. All of these things will be discussed as we go along.

"Case Studies" for Tooling

Discussion will center on only two welded assemblies, to be used as "case studies" for tooling. The first, which will be discussed in this installment, is a simple box structure, shown in Figs. 1 and 2. While rather elementary, this "product"—a composite of several welded assemblies—has been chosen for several reasons. Its simple construction is easily understood, so that operation sequences may be readily followed; it lends itself to a wide variety of fixtures, methods and means of handling and, like basic English (which covers essentials) can be expanded upon indefinitely to include practically any weldment made up of straight or curved sections. Finally, it serves to bring in war developed techniques which, now, are being diverted to the manufacture of consumer goods.

As may be seen, Figs. 1 and 2, the assembly consists of eight parts—a bottom plate (1); two side members (2); two end members (3); one center member (4), and two longitudinal bottom members (5) which may be designated as keels. The various members are joined together by a series of fillet welds (A, AB, AC, AD, AE, AF, AG, AH, AJ and AK), Vee (B and BB) and bevel groove (C and CC) joints. Material is mild steel, and overall dimensions may be stated as 36" wide x 18" high x 72" long, implying a rather heavy and bulky unit.

FIG. 1. The weldment, "Case study" No. 1. A and AB, AC, AD, AE, AF, AG, AH, AJ and AK are fillet welds. B and BB are Vee joints. Detail X is an alternate, bottom plate and side members.

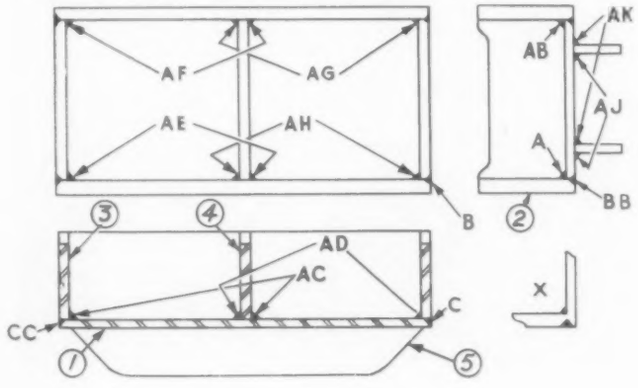
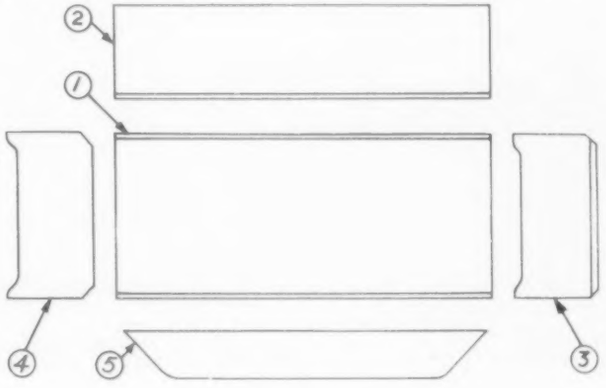


FIG. 2. Details of Weldment, Fig. 1, consisting of Det. 1, bottom; Det. 2, side members (2 req'd); Det. 3, end cross members (2 req'd); Det 4, center cross member, and Det. 5, keels (2 req'd). Material, mild steel.



We could, if we so desired, weld this assembly complete on any of several well-known welding positioners, such as are manufactured by the Cullen-Friestedt Company and the Ransome Machinery Company, or, if it were on a smaller scale, on the smaller positioners manufactured by the Standard Machinery Company. For positioners—see Figs. 3, 4, 5 and 6—are among the most versatile of welding fixtures, with an almost infinite range of application.

They are tiltable, through a range of about 135 degrees, from 45 degrees below horizontal to beyond vertical, also, the table is continuously rotative through the entire 360 degrees. As a result, a weldment may be positioned to suit the job—for horizontal, angular, vertical or downhand welding—and, by changing position, parts and assemblies may be welded right or left hand or end for end.

Yet, while fixtures in a sense, since weldments may be clamped directly to the table, they usually require auxiliary fixtures to hold work being processed on a mass scale. In this connection, they may be likened to machine tools which, for efficient performance, must have their complement of holding devices and cutting tools. In welding, the torch (or the arc, as the case may be) takes the place of the cutter, a rather pat simile considering that very accurate cutting, to intricate shapes, is now being done with the torch.

Positioners Highly Versatile

Everything considered, then, the welding positioner is a highly versatile tool, to be employed as a machine or fixture as occasion dictates. For in addition to its function as an adjustable fixture, it can be—and often is—used for continuous or skip circular welding, the table revolving while the welder holds the electrode or torch stationary. Used in connection with an automatic welding head, as shown in Figs. 7 and 8, the positioner becomes an automatic cycle machine to all practical purposes.

In view of the versatility of positioners, and considering their infinite range of application, one may wonder why other types of fixtures should be considered. For as described, positioners may be assumed to be the Alpha and Omega of welding fixtures in general; as such, sufficient unto themselves.

Yet broad though their scope of application may be, there are nevertheless practical limits to their use, especially so when conservation of floor space must be considered in connection with high production and easy flow of material. Take, for example, the universal milling machine—unquestionably one of the most versatile of machine tools—on which one may perform almost any machining operation within its range, outside of turning lengthy bar stock. And even that can be done with the exercise of a little ingenuity.

While it would be entirely practical to machine a limited number of complicated parts, complete, on the universal miller, such procedure would be rather expensive when producing parts in quantity. In the latter case, one would break the processing up into several operations, each to be performed on different machines. And all of these would not necessarily have to be millers.

The above reasoning applies partly to the weldment under discussion. As previously stated, it can be welded on positioners, either complete at one station—that is, first welding the top and then inverting it to weld the bottom—or, the top may be welded at one station and the bottom at an adjacent station. However, the several operations cannot be advantageously broken up so that the welding may progress, with synchronized timing, from positioner to positioner. Whatever might be gained, from such processing, would be cancelled out by clamping and handling.

As for time required for welding, we have a total of about 916 inches of weld, and assuming an average of five (5) beads or layers of weld for each joint, the grand total would be 4580 inches. At the rate of 10 inches per minute for hand welding, the time to complete one unit would be 7.6 hours very nearly. This time could be cut in half by employing two operators—the logical procedure—or, by resort to automatic welding heads, to an estimated 2½ hours.

Assuming, now, that the required output is 100 completed assemblies per diem, there would be required a minimum total of 32 positioners—and here, we are using round figures. However, the figure is arrived at by multiplying the output (100) by welding time (2½ hrs) and dividing this by an 8-hour shift—e.g. $100 \times 2.5/8 = 31.25$. Since we can't use one-fourth of a unit, we take the higher figure—32.

Now, with regard to floor space required for positioners. Allowing roughly 7 ft. for swing of the weldment, on the positioner, and a safe minimum of 4 ft. working space per side for each, the total length required would be 480 ft., or, if placed in two rows, 240 ft. Further allowing 4 ft. from aisle to positioner, with aisle 10 ft. wide, and 10 ft. minimum

FIG. 3. Model 140 C-F Positioner equipped with variable speed table rotation and power tilt. This model (14,000 lb. capacity) has a portable base with movable table height adjustment, is designed to handle a wide variety of heavy work as well as large and bulky assemblies. Photo by courtesy of Cullen-Friestedt Co., Chicago.

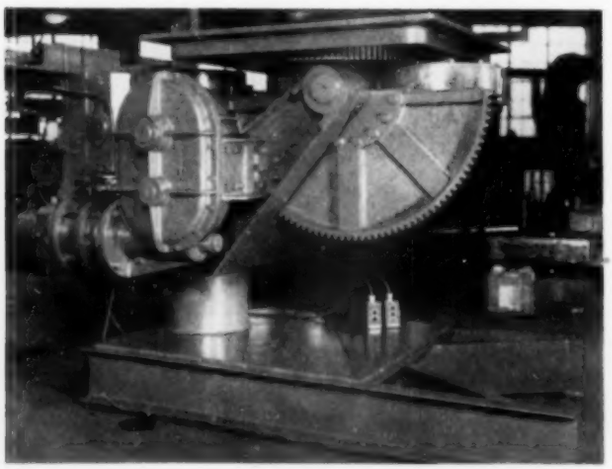
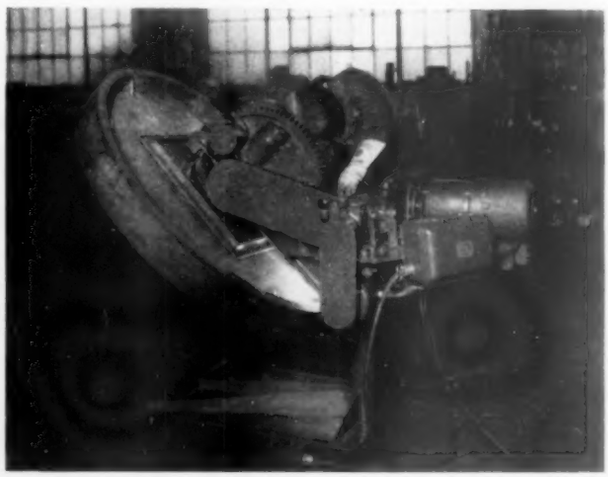


FIG. 4. Model 12 C-F Positioner (1200 lbs. capacity) equipped with power tilt and table rotation. As shown, circular work is advantageously handled on these positioners, which have either variable or constant table rotation. Power tilt is 135 degrees from horizontal, and table rotates 360 degrees regardless of tilt. Photo by courtesy of Cullen-Friestedt Co., Chicago.



width per row, we would require a plant roughly 60 ft. wide x 350 ft. long to provide for parts' storage, stress annealing furnaces and equipment. Say a total of 21,000 ft.—and this would be a minimum.

To handle the work, we would require cranes, with the implication of "leapfrogging" as previously suggested, and with the further implication of interferences and bottlenecks. As a result, there would be temporary idleness at each station. For consider, in this case, that the time for welding, at each station, would be almost identical, thereby precluding a staggering of crane lifts that, under ideal conditions, would service the various stations without interfering with others.

Straight Line Motion

It is a geometric axiom that the straight line is the shortest distance between two points. And now, we are going into straight line motion. At this point, however, it might be well to "process" the assembly — that is, break it up into its operation sequences. Instead of referring to these as operations, however, we will use the term *stations* and will describe the work done at each. The processing may be followed by referring to the flow diagrams, Figs. 9 and 10.

Sta. 1. Assemble one side member to bottom plate. Tack weld for temporary holding. Fixture.

Sta. 2. Weld fillet A. Roller conveyor. Automatic welding head.

Sta. 3. Tilt weldment 90° in opposite direction. Tilting fixture.

Sta. 4. Assemble opposite side member. Tack weld for temporary holding. Fixture.

Sta. 5. Weld fillet AB. Roller conveyor. Automatic welding head.

Sta. 6. Tilt weldment to horizontal position (roller fixture) and move to

Sta. 7. Assemble end and center cross members. Tack weld for temporary holding and pass to shuttle

Sta. 8. With weldment on stub roller conveyor carriage, move weldment to any open fixture at

Sta. 9. With weldment on tilting fixture, down weld Vee joints B (one end) and fillets AE and AF; also, fillets AC. On completing these welds, tilt fixture in opposite direction and weld Vee joint B (opposite end) and fillets AG and AH; also, fillets AD. Pass weldment to shuttle

Sta. 10. With weldment on stub roller conveyor carriage, move weldment back to main line and pass to

Sta. 11. Rollover fixture (or cage) inverts weldment, which moves to

Sta. 12. Weld Vee joints BB. Roller conveyor fixture. Use Unionmelt—i.e., automatic welding.

Sta. 13. On rollover (similar to Sta. 11) roll weldment 90 degrees, and pass to

Sta. 14. Use welding positioner provided with stub roller conveyor and hydraulic stops and clamps. Rotate table (which is vertical in relation to the floor) 90 degrees, and weld bevel joint C, one end. One end welded, rotate table 180 degrees, and weld opposite bevel joint CC. Unionmelt.

Sta. 15. On rollover (similar to Stas. 11 and 13) tilt weldment 45 degrees and move to

Sta. 16. With weldment tilted 45 degrees, locate keels and tack weld for temporary holding. Locating gages. Move weldment to

Sta. 17. Weld fillets AJ. Conveyor tilted at 45 degrees. Automatic welding. Part of conveyor is tiltable from horizontal to 45 degrees. Weldment leaves Sta. 17 in horizontal position, and passes to

Sta. 18. Weld fillets AK. Roller conveyor, set at 45 degrees in opposite direction. Automatic welding. Weldment passes to

Sta. 19. Tilting fixture, from 45 degrees to horizontal. Now horizontal, the weldment passes to shuttle carriage

Sta. 20. Visual inspection during interval of transferring to

Sta. 21. Where a similar shuttle carriage moves weldment to any of several open furnaces at

Sta. 22. Stress anneal. After annealing, weldment discharges to

Sta. 23. A shuttle carriage, similar to those at Stas. 20 and 21, which returns weldment to (a) main line for further inspection, or (b) to aisle for removal by truck or crane.

Automatic Welding

At this point, we will check on time consumed. Referring to Figs. 9 and 10, it will be seen that welding at Stas. 2 and 5 is automatic. Assuming 25* inches per minute, the time required, to lay one bead, would be 3 minutes very nearly. Further assuming 5 beads deposited, with chipping between layers 1 to 5 (4 chippings), and further assuming continuous travel on the conveyor, the length required for the two sections (2 and 5) would be 60 ft. very nearly.

However, the time per weld would still be 3 minutes which, with gaps between stations, would probably run into 4 minutes. About an equal interval of time would be required

**On thin stock, up to 200" per minute is possible with automatic welding.*

FIG. 5. On a smaller scale, yet rugged and embodying the versatile features of the larger units, is the Welding Positioner made by the Standard Machinery Company, Providence, R. I. Tables are completely rotative, and tiltable 135 degrees from 45° below center to horizontal.

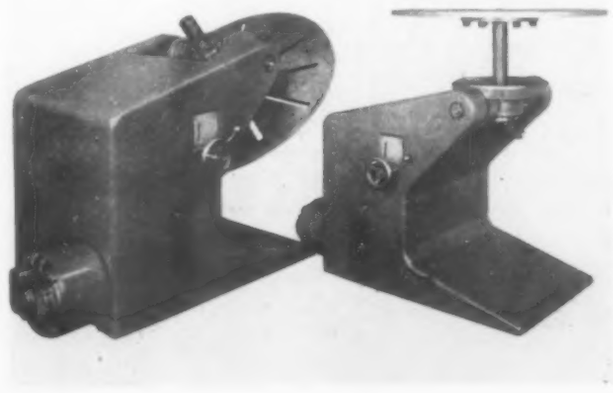
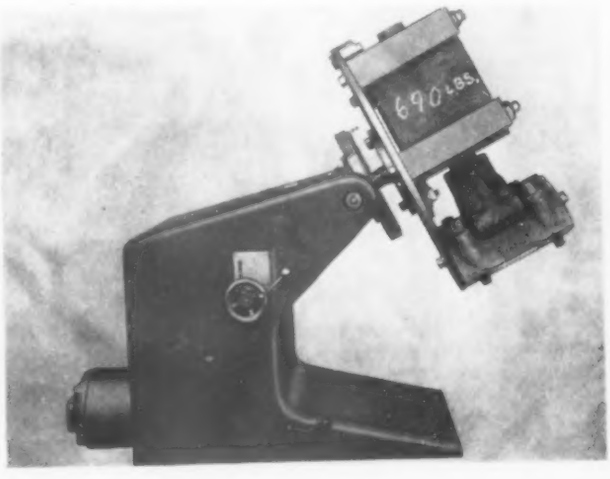


FIG. 6. Attesting to the ruggedness of the Standard positioner is the 690 lb. weldment shown in the illustration. In addition to the motor drive, for table rotation, tilt is effected by a hydraulic cylinder, the combination resulting in unusual speed of operation.



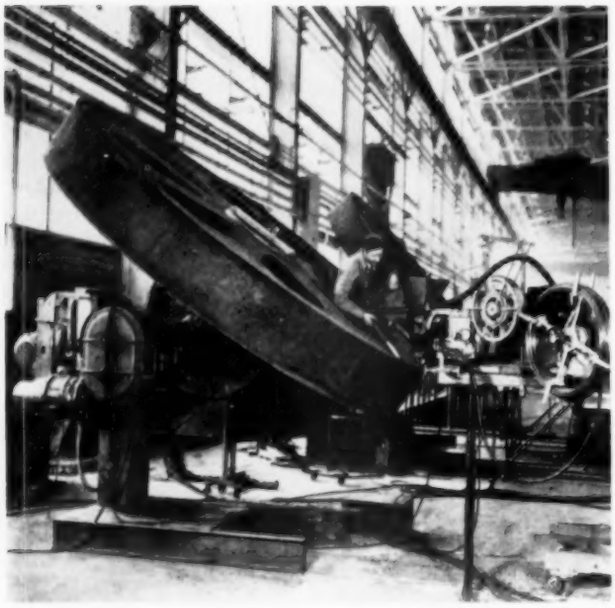


FIG. 7. Automatic welding on a 12 ft. turbine reduction gear. The weldment is mounted on a C-F positioner, with variable speed table rotation from 0 rpm and up. The gear is rotated under a Unionmelt automatic welding machine to lay a peripheral fillet 1⅛" across the face and 36 ft. total length in one pass. No subsequent removal of welding spatter or machining is necessary. Photo courtesy of Cullen-Friestedt Co.

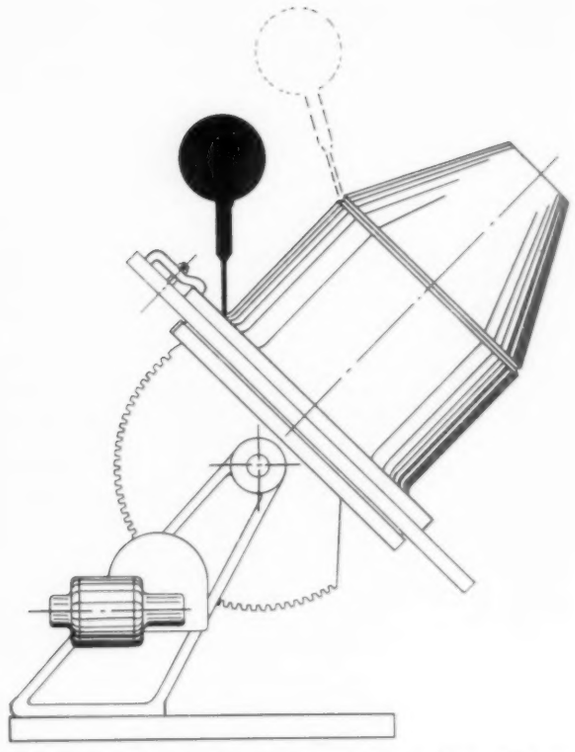


FIG. 8. Diagram showing continuous automatic welding, or flange-cylinder-cone assembly, performed on welding positioner in combination with automatic welding head. Heads (shown in silhouette and dotted outline) are stationary, but unmounted on adjustable stand, not shown in drawing.

for assembling at Stas. 1 and 4, and transferring between Stas. 2 and 4 and levelling off at Sta. 6. We can further assume a 4-minute interval for assembling the cross members at Sta. 7, so that the weldments will be coming to Sta. 8 at the rate of one every 4 minutes.

The Vee joints B, and fillets AC, AD, AE, AF, AG and AH total 360 inches, to be laid on (manually in this case) at the rate of 10 inches per minute. Two beads would be required, so that total welding time would be $720''/10 = 72$ minutes for welding. However, two operators would be employed, cutting time approximately in half—that is, to 36 minutes. Allowing for chipping (one pass per joint) and tilting, transfer and incidental handling, the total time would probably total 60 minutes. We would therefore require 15 fixtures and 30 operators at this station.

Bypassing stations 10 and 11—which are handling stations easily synchronized with the 4-minute time cycle—we come

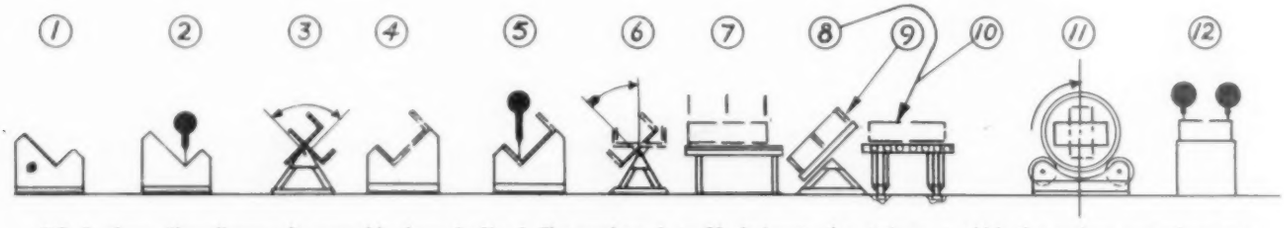
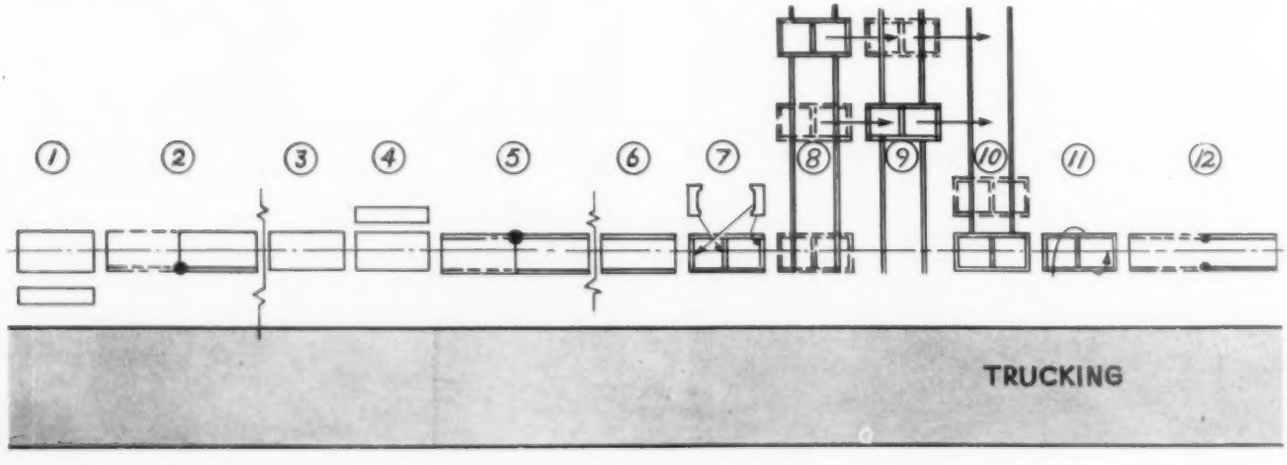


FIG. 9, above. Flow diagram for assembly shown in Fig. 1. The numbers 1 to 23 designate the stations at which the various operations are performed.



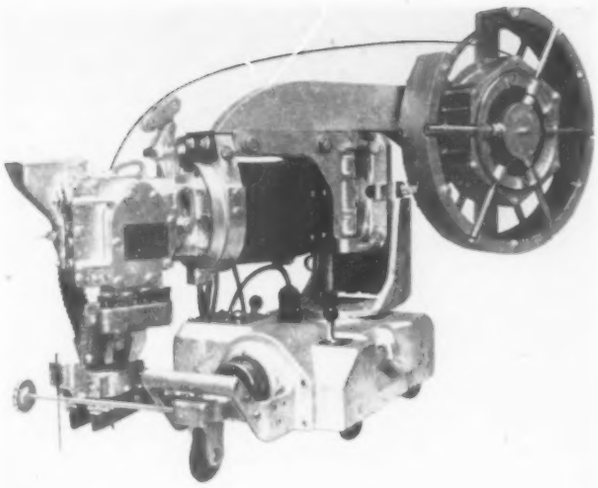


FIG. 11. The Type U Unionmelt Welding Machine, in combination with a 25 lb. rod reel, mounted on a mechanized carriage. With this machine, welds up to 3" thick can be made in one pass, while thin sheet stock can be welded at rates up to 180 inches per minute. With this machine, a granulated material, deposited on the joint ahead of the arc, blankets the welding action and protects the weld until cool. It then breaks free, leaving the seam clean. Photo by courtesy of the Linde Air Products Co., unit of Union Carbide & Carbon Corp'n.

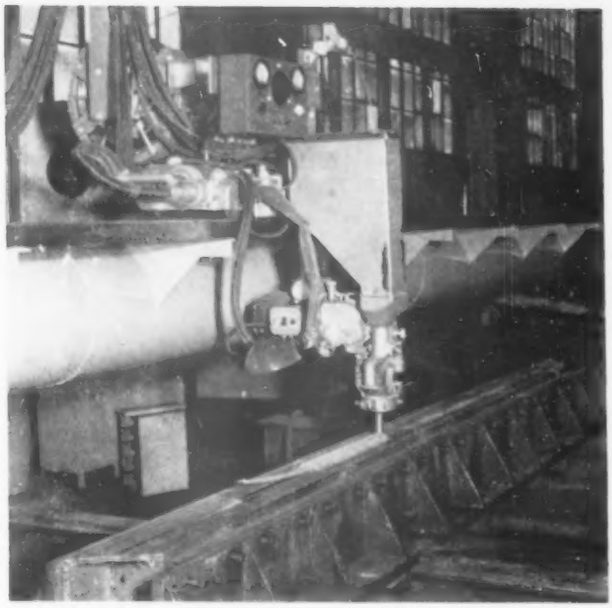


FIG 12. The Type UE Unionmelt Welding Machine arranged for straight line welding in the fabrication of structural members. Note the track on which the mechanized carriage travels at the correct speed for any thickness of metal being welded. Photo by courtesy of Linde Air Products Company.

to Sta. 12, where the bottom Vee joints (BB) are welded. Here, we employ Unionmelt (see Figs. 11 and 12), and the joints are welded simultaneously (using two heads) at a rate comparing favorably with the previous automatic welding—that is, at the rate of 4 minutes per pass. No chipping is required here, as the complete weld is made in the one pass.

Now bypassing Station 13 (handling) we come to Sta. 14, where a positioner is used for the joints C and CC. Here, we also employ Unionmelt and, since each weld is only 36" long, we may assume that the 4-minute interval holds, including the time to rotate the positioner.

Bypassing Stations 15 and 16 (handling and assembling) we come to Sta. 17—welding the keels. Here, two beads are required, with chipping between each, so that the length of line required would be approximately 25 ft. The welding heads will have to be staggered, one slightly ahead of the other, due to proximity occasioned by the 45 degree angle. However, the 4-minute time cycle holds as before.

We now come to a possible bottleneck—the stress annealing furnaces. However, we have assumed the 100 weldments per diem to be made in an 8-hour shift, consequently, we can accumulate at Station 20 and run three shifts to take

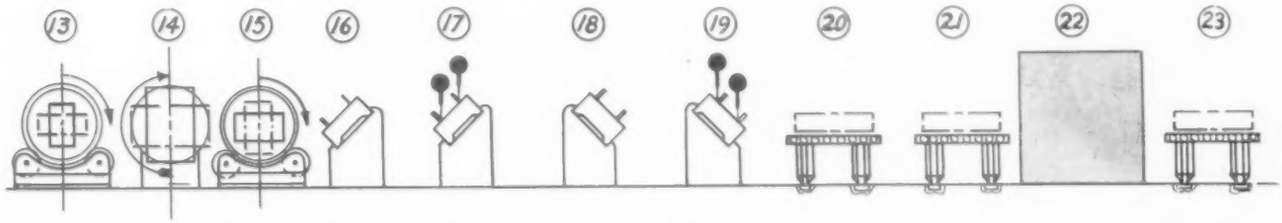
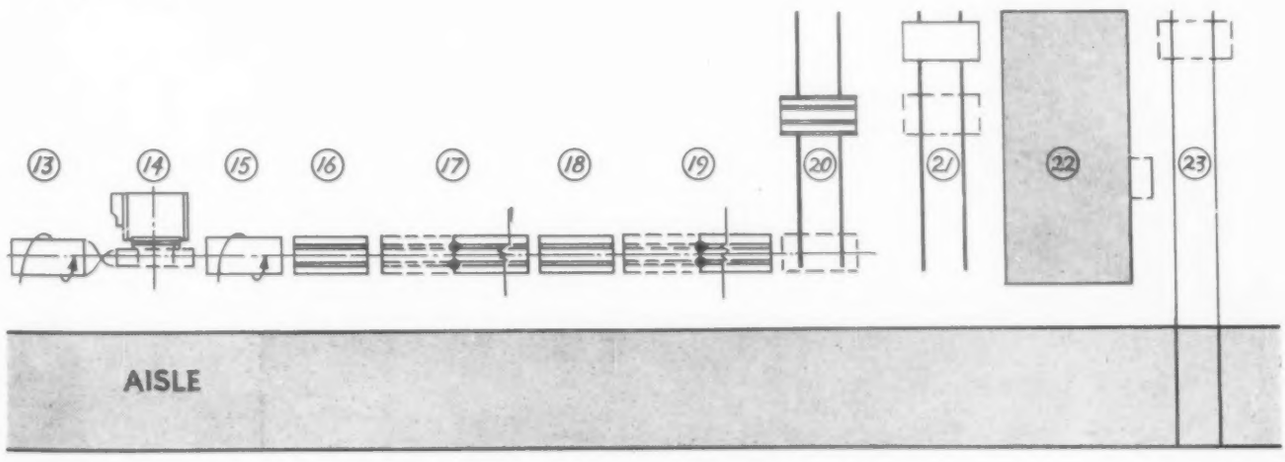


FIG. 10, below. Plan view of flow diagram; Fig. 9. The station numbers of both correspond, and numbers tie in with the fixtures to be discussed later in the article.



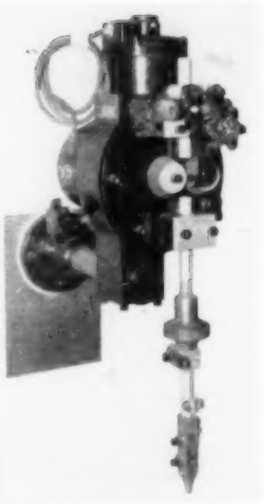


FIG. 13. The G-E Type WFB Thyratron-Controlled Automatic Arc Welding Head, shown in vertical position on mounting support. The head can be swivelled, radially, and further angled by auxiliary mounting, to weld at the most advantageous angle. Feed of electrode is automatic, insuring the correct gap at all times, and the head may be mounted on a travelling carriage for automatic welding of intricate shapes. Photo by courtesy of General Electric Co.

care of the stress annealing. That would be more economical than installing furnaces to keep pace with the welding. Aside from that, however, and the hand welding at Sta. 9, each operation has been performed in close synchrony and without deviating from a straight line.

Now, summing up time required, we have: Stas. 1 to 7, and 8 and 10, 4 minutes each, or 36 minutes; Sta. 9, 1 hr. (per weldment); Stas. 10 to 20, 4 min. each or 44 minutes. Disregarding the stress annealing (for reasons previously stated) the total time per weldment would be 2 hrs. 20 minutes. The average time at each station—1 to 20—would be 7 minutes. We have not overlooked the fact that 15 crews of two operators each would be working at Sta. 9; however, we are only concerned with the time to weld one assembly. Normally, one weldment should be delivered from Sta. 9 every 4 minutes—i.e., 60/15 = 4.

Production Quota Assured

At this rate, we obtain an output of 15 welded assemblies per hour, making a total of 120 per 8-hour day. This, of course, presumes an uninterrupted flow, usually obtainable only under the most ideal conditions. With a 20 per cent plus leeway, however, we can safely assume that a production rate of 100 per diem will be maintained, with adequate allowance for repairs and possible rejects.

Adding up the total number of operators, we have two at Stas. 1 and 4; one each at Stas. 2, 3, 5 and 6; two at Sta. 7; one at Sta. 8; 30 at Sta. 9; one for Stas. 10 and 11; one at Sta. 12; one at Sta. 13; and one at Sta. 14; one at Sta. 15; two at Stas. 16 and 17; two at Stas. 18 and 19, and one at Sta. 20. Total operators, 49 as against 62 required for positioners. And we've had no crane lifting, nor the extra floor help—including crane hookers—that would be required had positioners been used exclusively.

FIG. 14. Alternative flow chart for assembly shown in Fig. 1. Contrasted to Figs. 9 and 10, turntables are used to turn weldments 90 degrees, thereby maintaining a straight flow with resultant economy in flow space.

Floor Space Conserved

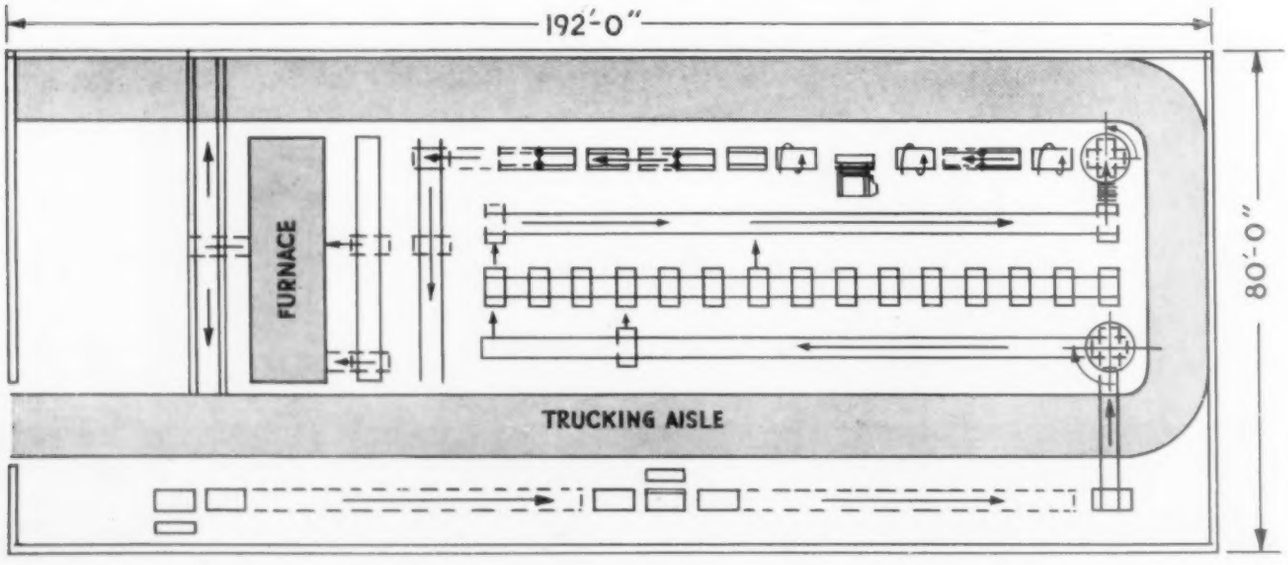
Now, for floor space. With the exception of Stas. 8, 9, 10, and 20, 21, 22 and 23, no fixture or conveyor is over 6 ft. wide. The majority will not exceed 4 ft. Furthermore, we are working almost entirely from one side, at each fixture, so that we can assume a maximum width of 10 ft. for the line.

For length, we can figure each fixture to be 72" long, with only about 12", average, between each, for clearance. Stas. 2 to 5 would require 60 ft. as previously stated, and Stas. 12, 17 and 19 would require roughly 12 ft. each. The total length of the line would therefore be 266 ft. Adding roughly 44 ft. would include Stas. 20 to 23, making a total length of 310 ft. An extra 40 ft. would allow for parts receiving and storage, and for accumulation at the end of the line, the whole comparing favorably with the previous layout. The "plant" would be 350 ft. long.

The lateral occasioned by Stas. 8, 9, and 10 would require a floor space of 30 x 100 ft., and that occasioned by Stas. 20, 21, 22, and 23 about 50 x 50 ft. Allowing a 10 ft. aisle beside the main line, its total width would be 20 ft. Multiplying this by 350 ft. (total length) we would have 7000 ft., plus 3000 and 2500 ft. for the laterals, making a total of 12,500 ft. for the plant. This, too, would be a minimum.

We could cancel out the awkward situation created by the laterals by doubling back on the line, as suggested in the alternate flow diagram, Fig. 14. In doing so, we would not materially divert from a straight line flow, since fixtures at the corners could be designed turntable style. However, it has not been the intent, here, to establish arbitrary rules, but to convey ideas which, with variations, may be applied to welding problems.

For example, the 80' x 192' "plant" suggested in the flow diagram, Fig. 14, shows no provision for material storage, receiving, inspection or shipping, all of which would be essential considerations—among many other things—in plant layout. The reader will note, however, that the various stations have all been numbered, and these numbers will tie in with the fixtures, which will be discussed in the following installment.



Because automatic welding plays an important role in the operation sequences, we have introduced two leading automatic machines—the General Electric, and Unionmelt, by Linde Air Products Co. Shown, on this page, are typical applications of automatic welding, employing General Electric Machines. Of particular interest is the comparatively simple fixtures used—as, for example, the continuous welding, Fig. 17, on a specially designed fixture. Also of interest is the seam welder (below) on which the work turns on rollers. This setup—and the one in Fig. 16—is very much in line with the simple fixtures used to process the assembly shown in Figs. 1 and 2.

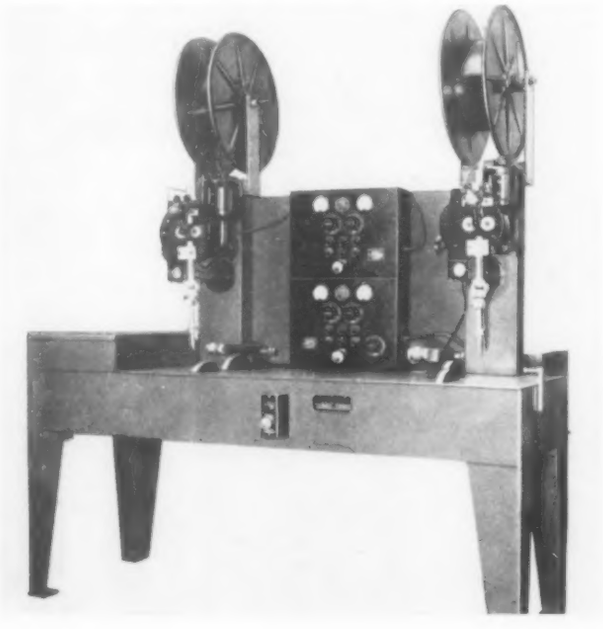
As a concluding note, to this installment, it might be well to suggest that nothing in the foregoing is to be construed as disparagement of welding positioners. We are discussing welding fixtures for mass production, with straight line work flow and the elimination of cranes except as these may be used as possible auxiliaries for material handling.

As tool engineers, we sometimes go to extremes, in our thinking, where production is concerned. We are too inclined to think in terms of mass quantities. Yet, all production is not on a mass scale, and it is just as important that the jobbing shop (or the plant making a product on a small scale) have tools suited to its work flow as it is that the automobile plant has tools suited to the production of huge quantities.

And, while welding positioners are suited to the mass production of a wide range of work, they are the ideal tools for jobbing shops and plants making cumbersome structures in comparatively short runs. In many cases, no other tool will serve as well. For one thing, they greatly expediated the manufacture of war materials, enabling manufacturers to get going on rush orders that left little or no time for fixture design. And they serve equally well for the manufacture of consumer goods. They also serve as reserves in straight line flow, as will be shown later in this series.

FIG. 15, below. An interesting setup, for seam welding, employing a type WSH G-E Seam Welder. Note the rollers on which the work rotates under the dial welding heads, and the tension arms used to insure pressure for traction. Photo by courtesy of General Electric Co.

FIG. 16, right. Machine for continuously arc welding fractional hp Motor Starter Shells. The shells are hopper fed and all operation sequences, hydraulically and electrically controlled, are fully automatic. Photo by courtesy of General Electric Company.



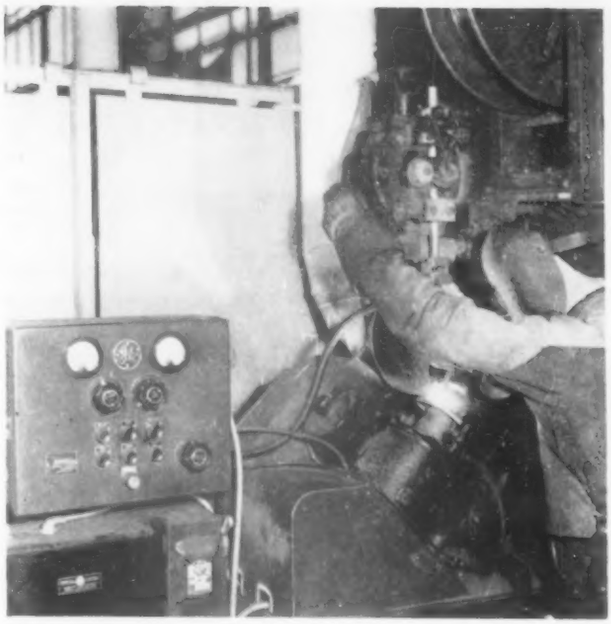
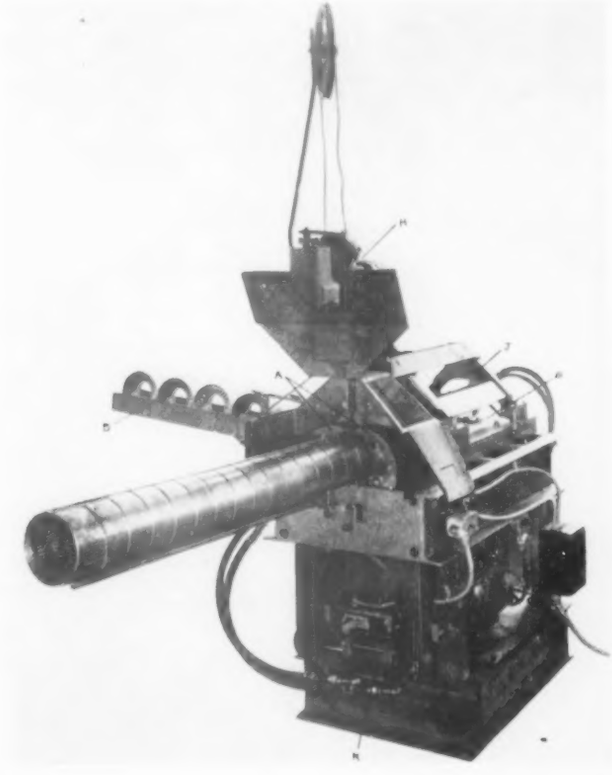


FIG. 17. Automatic welding with a General Electric Thyratron-Controlled Automatic Arc Welding Head, type WFB. With this system, welding speeds well over 100 inches per minute are possible on thin gage stock, with progressively slower speeds on heavy stock, due to difference in heat diffusion. In this case, a specially designed fixture, set on an angle approximating 45 degrees, is used for welding a flange to a pressed steel cup. Photo by courtesy of General Electric Company.

End of first installment, this Series. Installment No. 2 will follow in the January issue, *The Tool Engineer*. In the following installment, we will discuss the fixtures used, with recommendations for design. And, since reference will be made to the layouts and illustrations in this issue, it is suggested that readers retain copies, carrying each installment, until the series is completed.



By Thomas A. Dickinson

Homemade Presses for Plastics

Presenting Two "Make-It-Yourself" Presses for Molding Phenol-Formaldehyde Compounds

Mr. Dickinson

TWO UNPATENTED DESIGNS for presses are shown in the accompanying drawings. They were developed by a West Coast plastics firm for the low-cost, small-scale molding of casting resins—such as those utilized in making plastic tooling. Both details and dimensions of either press can be varied indefinitely for special jobs, and the general structural features are so simple that they could be readily duplicated in almost any good machine shop.

The presses are utilized in connection with casting resins, and while they cannot exert high pressure—although they will provide enough force to eliminate the air bubbles and porosity that so frequently necessitate the rejection of articles cast without pressure—they have been particularly useful in molding phenol-formaldehyde compounds.

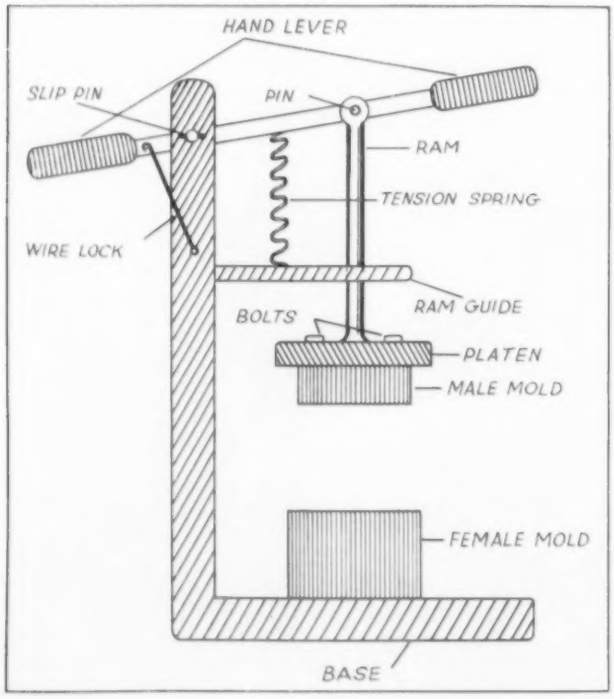
Simplest of the two is a manually-operated machine with a double-handled lever which will enable two men to apply pressure when necessary. Pins on the lever and a wire lock make it possible to hold the lever in any given ram position, while a tension spring facilitates downward movements. Male and female molds are respectively attached to a platen on the lower end of the ram and the base of the press. A slip pin and ram-guide arrangement enables the ram to move straight up and down.

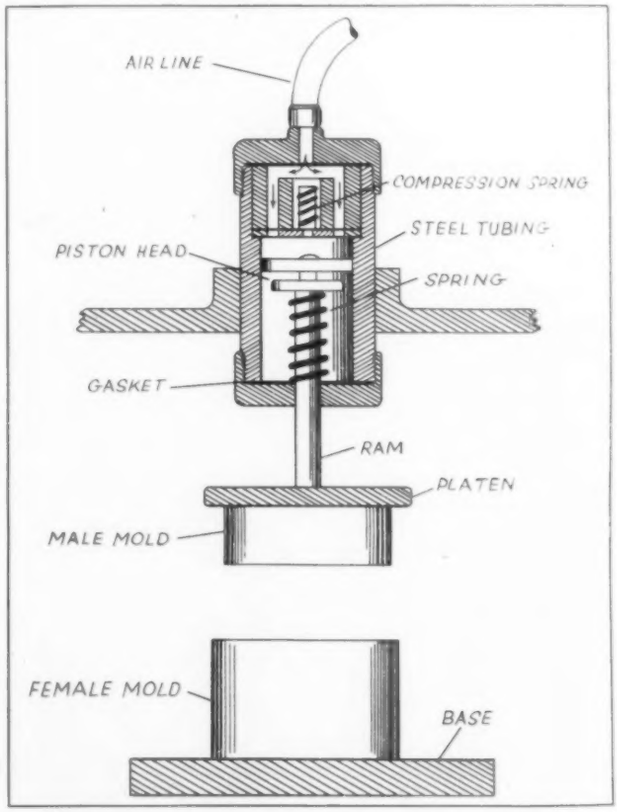
The second press makes use of a simple air cylinder, which has a compression spring to obviate the jerky movements that too often make pneumatic power unsuitable for press work. Body of the cylinder is a suitable length of cold-drawn steel tube, whose inside diameter is 1½"; and, except for the fact that it is comparatively large (having a head area of 1.767"), it is similar to the cylinders used in making automobile tire pumps. The average shop pressure of 80 pounds per square inch may be utilized in operating the cylinder, and it will produce a maximum thrust of 141 pounds—or, if the operating leverage is arranged to multiply the power three or four times, a holding pressure of 400 to 600 pounds.

In utilizing either press, flash-type molds are preferable because they will insure adequate composition of the finished product and should not necessitate an excessive waste of materials. Curing heat for the molds can be supplied at the base of the press, or by infra-red bulbs adjacent to the press, and may be considerably higher than the curing temperatures used in hardening plastics without pressure.

Molds can be made from numerous alloys by casting, or from asbestos-filled phenolics, and should be coated with a good grade of wax to facilitate removal of casts. When it is necessary to cast thermoplastics in the molds, the female mold should be heated to at least half the temperature of the molten resin to prevent premature hardening and flow lines.

The presses are particularly useful in forming articles with complex shapes or thin walls, since they will force the resin into all parts of the mold cavities and eliminate structure-weakening bubbles. However, since they must be handled with some skill and require a comparatively long curing cycle, they cannot be considered competitive with standard machine tools in mass production.





By D. P. Walsh

Practical Tool Inspection and Quality Control Methods*

In Which the Author Applies Magnaflux and Zyglo Techniques to the Inspection of Perishable Tools

ALL PERISHABLE TOOLS, ranging from small bits and drills to expensive cutters, are repeat items which run up costs. This is particularly true if a percentage of tools is defective. However, it is also true of excellent tools if they are used improperly or misapplied, as perfectly good tools will produce either quality or scrap, depending upon how they are assigned and used.

It is necessary, therefore, that planning and design departments consider the tools' limitations and specify the correct tool for the job to be done.

D. P. Walsh is a native of Ireland. Resident in the United States since 1924, he has been active in engineering, supervision and sales. In 1942, he joined the Magnaflux Corporation, and is now district manager, Detroit office. He is a member of the A.S.T.E., Detroit Chapter, the American Society for Quality Control, the A.S.M. and the Engineering Soc'y of Detroit.

In the interest of economy for both manufacturer and user, it is desirable that reasonable standards of quality be agreed upon. Combination of the experiences of both, through consultation with each other, is common practice and is adding invaluable practical knowledge to theory. Standards on limits, tolerance, inspection methods, and on the ability of the tool to produce results, can be ironed out under equitable conditions when the problems and difficulties of each are understood and appreciated by the other. Increased production and greater economy will be the end result.

**Resume of paper presented before Cincinnati Chapter, A.S.T.E.*

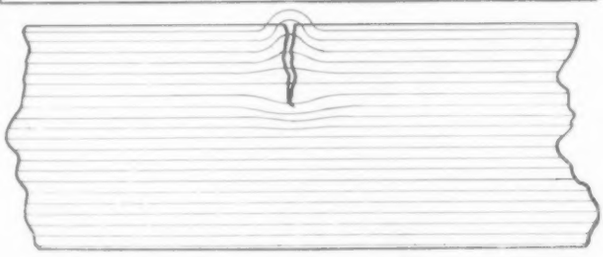
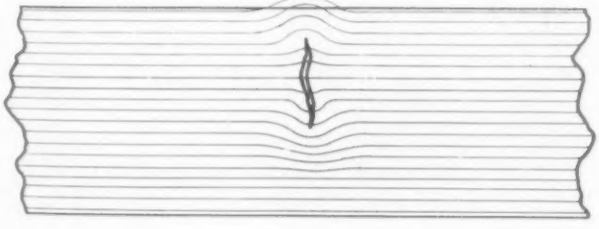


FIG. 1. Magnetic flux distribution at a surface defect.

FIG. 2. Magnetic flux distribution at a subsurface defect.



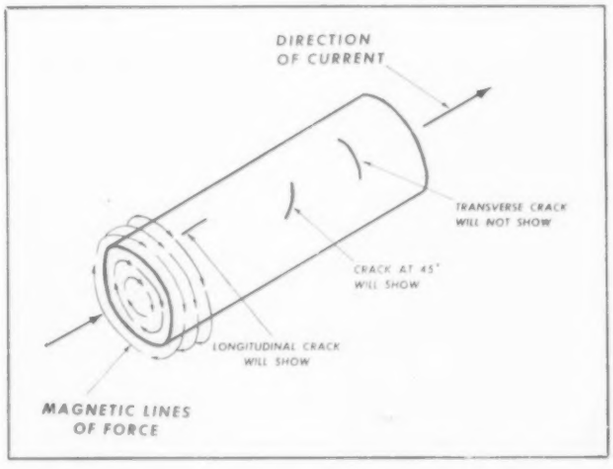
The tool *manufacturer* has his problems, among which we will consider the following "defects." On high speed steel, there may be voids or inclusions in the metal, heat treat or quenching cracks, stress relieving troubles, or grinding checks. Carbides present brazing, grinding, and lapping troubles. On stellite, difficulties may be had with welding, porosity, or grinding.

In the hands of the *users*, problems are similar to the above, and tools become dull and must be sharpened. In addition, there may be problems such as special shapes and salvage methods. With the user, also, lies the burden of proper application and use, including the correct machine tool and fixture setup. Manufacturer and user have in common the problems of inherent defects in raw materials, tolerances, and special, pet methods of personnel. The latter, while individually having good points for each of the varying methods, cannot all be right, nor can they all be wrong. One method must be best for each type of tool.

With these problems in mind, the obvious thing to do is to use a sensitive, non-destructive inspection method which will give an economical over-all picture of the tool, and an adequate answer on all types of relevant defects, so that they may be eliminated as early as possible. In addition, this inspection method should serve as an impartial judge on the result of processing techniques by showing which is good and which is bad, thus assisting in the early elimination of faulty methods. It should also be adaptable for economical use in weeding out defective stock prior to spending any processing time on it.

Two such inspection methods will now be discussed. Both give an overall picture of the complete tool and provide adequate sensitivity, which may be controlled to suit individual needs. With either method, *magnetic particle* or *fluorescent penetration*, the only preparation necessary is that tools be clean and free from oil, grease, dirt, and loose paint or scale.

FIG. 3. Cracks located at an angle to the longitudinal flow of the magnetic lines of force are easily detected by longitudinal magnetization. Of course, magnetic fields in more than one direction are necessary to locate defects in any direction.


DIRECTION OF CURRENT
TRANSVERSE CRACK WILL NOT SHOW
CRACK AT 45° WILL SHOW
LONGITUDINAL CRACK WILL SHOW
MAGNETIC LINES OF FORCE

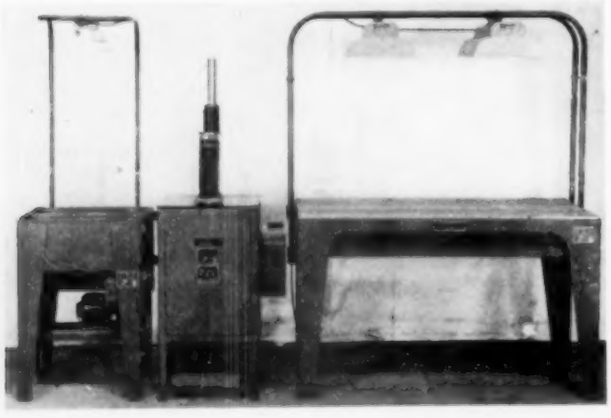
In 1929 the *magnetic particle* (Magnaflux) inspection method actually had its first practical application. A year later, in 1930, it was first installed in a plant for aircraft parts' inspection. In 1934 it was adopted for tool inspection. This method is limited to magnetizable materials. It requires that a magnetic field be set up in such a direction as to be at an angle to suspected defects.

Fig. 1 shows path of magnetic flux around a surface defect, while Fig. 2 shows path of magnetic flux around a sub-surface defect. This method employs the local magnetic leakage fields caused by such discontinuities to attract and hold finely divided ferro-magnetic particles in a pattern which indicates the location, extent, and type of defect. Fig. 3 shows cracks located by circular magnetization but now shown by longitudinal. Magnetic fields in more than one direction are necessary to locate defects in any direction. Variations in technique, however, may be employed for any particular job.

On tools, the magnetizing force may be either alternating or direct current. Alternating current is preferable since it provides a means for demagnetization after inspection. Either circular or longitudinal magnetization, or both, may be used, depending upon the direction of the defects sought and the shape of the tool. In many cases, one or the other will suffice. Either the dry or the wet method is applicable.

FIG. 4. Equipment designed for wet continuous ac method of Magnaflux inspection by application of particles. For circular or longitudinal inspection, the equipment includes a V-shaped tank, for holding refined kerosene in which magnetic particles are suspended, and kept in agitation by pump. Transformers and other apparatus are also located in the large cabinet.

FIG. 5. Equipment for residual inspection of tools, bar stock, includes a tank, left, for wet method, and table for the dry method. Low voltage is used, with high current controlled by rheostat and knife switch.



In the wet method, approximately 2% of particles, by volume, are suspended in a light oil distillate which is agitated. The suspension may be applied by a hose and nozzle, or by immersion. This method is preferable for finished tools, while the dry method is advantageous on rough rounds or bar stock. The dry particles may be applied by hand shaker, bulb, or low velocity blower. Particles coated with fluorescent material (Magnaglo) provide a brilliant indication under "black light" and are excellent on unevenly lighted or dark surfaces offering poor contrast to red or black paste.

The continuous or residual method may be employed. In the continuous method the part is covered with particles while being magnetized, while in the residual method the tool is first magnetized and later the particles are applied.

Fig. 4 shows equipment designed for wet continuous ac method, circular and longitudinal, application of particles, demagnetization; and Fig. 5 shows equipment for residual inspection with tank for wet, and inspection table for dry method. A highly efficient variation is to have the tank equipped with air operated contact plates and a coil and powered by a portable unit. The portable unit with cables and blower can readily be moved to inspect rough rounds or stock at any plant location.

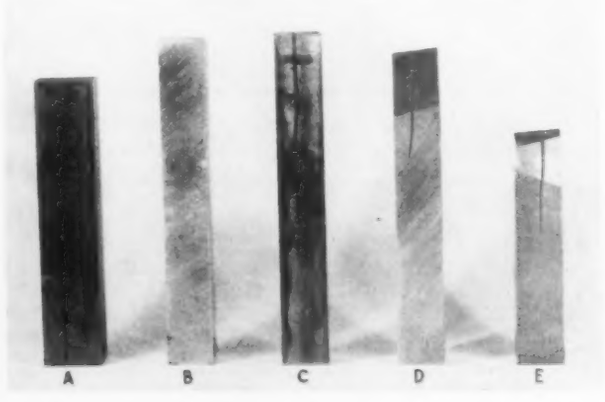
If the steel inspected is soft (under Rockwell C 20) the continuous method is necessary. However, since tool steel is relatively hard, the residual method is recommended, particularly on finished tools where it will not produce indications of irrelevant sub-surface conditions. In employing the wet residual method it is desirable that the tool remain immersed in the suspension, or surrounded by particles, for a few seconds.

Magnaflux Techniques

The amount of amperage used is also of some importance. Most people are too familiar with aircraft parts inspection only, where, with alloy steels, 800 to 1200 amps. per inch of diameter is specified. Tool steels are different.

Here, 300 to 500 amps. per inch of diameter is ample. This point is important, due to the greater resistance of tool steels and the consequently greater possibility of arcing, heating, and burning in cases where current is passed through the tool. Considerably higher amperage may be used for coil shots, or when central conductor, or bar shots are used. The duration of the current flow should be approximately one-half second, or equivalent to the time required for the hand of the ammeter to reach the chosen amperage value and return, without pause to zero.

FIG. 6. Considerable savings in steel tools can be effected by studying magnetic particle results, as shown. Reading from left to right, "A" shows seam probably opened up in heat treatment. "B" reveals indications of sub-surface voids or inclusions; "C" shows heavy inclusion, near surface; "D" and "E" are examples, after grinding.



Magnaflux indications are formed by a pattern of particles held by a leaking magnetic field directly over the defect. The shape and appearance of this pattern will depend upon the magnetic disturbance caused by the defect.

Since discontinuities such as inclusions, seams, laps, quench cracks, and grinding checks have their individual characteristics as to size, shape and position, the magnetic particle indications of each will also be readily interpreted. In the event of uncertainty the answer may be provided by sectioning, etching, and examination under magnification. On samples so destructively tested, a portion of the indication should be preserved by coating with clear lacquer, then the sample should be tagged showing data as to the depth, extent, and so forth of the defect, and the whole retained for future reference.

Fig. 6 shows seams, inclusions, and quench cracks on steel tools. It is fairly obvious that intelligent inspection by the magnetic particle method not only will assure quality tools, but will actually produce considerable savings. In Fig. 6-A, for example, the indication shown is that of a seam which probably opened up in heat treat. It would be shown by Magnaflux in the rough stock, and although fairly large, it would not be detected by visual inspection until some grinding had been done. The magnetic particle indication of a seam is relatively heavy and generally runs fairly straight in a longitudinal or helical direction.

The indications in Fig. 6-B are those of sub-surface voids or inclusions in the metal. They are flat with irregular edges, and generally fade out, or become more pronounced, alternately depending upon the direction of the inclusion, away from or toward the surface.

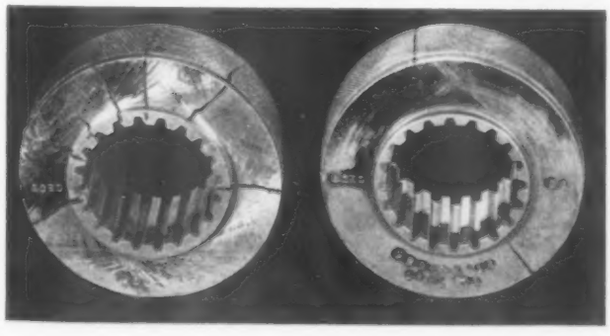
In this case they are relatively small and deep and probably will not open up in heat treat or quenching, but the residual stress will be aggravated. They will eventually open up in grinding and will progress in length as grinding continues. Without proper inspection they will not be detected until grinding and consequent expense has progressed considerably.

A heavy inclusion, near the surface, Fig. 6-C, will open up in heat treat, but it also may not be found visually until after grinding. Examples, after grinding, are shown in Figs. 6-D and 6-E. The indications of cracks will have regular edges and definite height and will appear as if a thread were placed on the metal. The type of crack can readily be recognized from size, shape, and location.

Zyglo, or "Black Light"

In addition to its use on perishable tools, Magnaflux is of considerable value for preventive maintenance inspection on all types of machinery. Examples are the inspection of various shafts, axles, grinder spindles, crane hooks, and so forth, at regular overhaul periods or when equipment is being rebuilt. On large stamping dies, Magnaflux will also show fatigue cracks.

FIG. 7. Quench cracks are also expensive trouble-makers.



Scotch tape transfers of the fatigue crack indications can be taken from time to time, and the growth of fatigue cracks can be thus studied. The object of such inspection is to determine just how far the fatigue crack will grow before failure occurs so that the die may be replaced during a night shift or other such period, so that no downtime will result.

The second important inspection method to be mentioned is *fluorescent penetrant* (Zyglo) inspection, sometimes referred to as "black light" inspection. It is recommended for carbides, which do not lend themselves to Magnaflux inspection, and for stellite, which is non-magnetic. It was first installed for industrial use in 1942. A year later it was adopted for the inspection of carbide tipped tools.

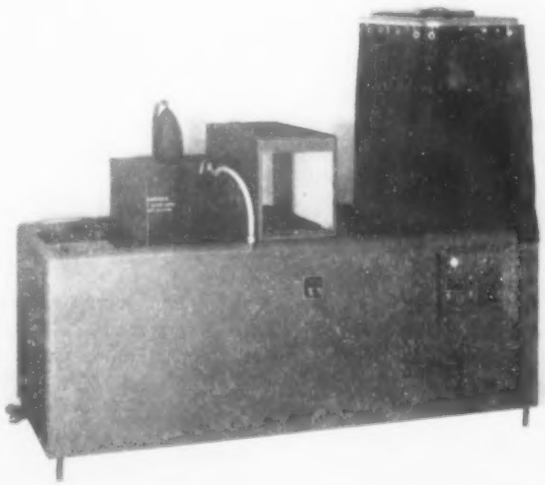


FIG. 8. "Black light" inspection equipment for production inspection of small parts. Stations provided include dip and drain, wash, dry, develop and inspection.

FIG. 9. Fluorescent equipment designed for tool inspection in small plants.

Fluorescent penetrant inspection, using Zyglo equipment and materials, is a non-destructive method which, by means of fluorescent penetrant and black light, locates discontinuities at, or opening to the surface. Its use is not limited to metals, and it may be used on practically all solid materials. It is versatile in application and is used with special techniques for many special inspection or testing applications.

The essentials of this method are as follows: (1) Penetration of the defect by fluorescent penetrant; (2) removal of excess penetrant from the surface by washing with hot or cold water, preferably as a spray; (3) developing the indication, if necessary, for greatest sensitivity, using wet or dry developer; and (4) inspection under black light. A brilliant fluorescent indication will mark the defect.

Fig. 8 shows equipment designed for production inspection of small parts. It is provided with a recirculating air drier and the following stations: dip and drain, wash, dry, develop and inspect. Fig. 9 shows equipment designed for tool inspection in small plants. The stations are: dip and drain, wash and air dry, develop and inspect.

Penetration time will vary, depending upon the type of material and the tightness of the defect. In carbide tipped tools, one minute or less is sufficient for newly ground tools. Similar time is satisfactory on stellite faced tools. Steel, depending of course on the size of the defects, may require 5 to 15 minutes of penetration time, depending upon cleanliness, i.e., freedom from dirt, oil, and grease. Hot water, if available, will speed up drying, but otherwise has no particular advantage.

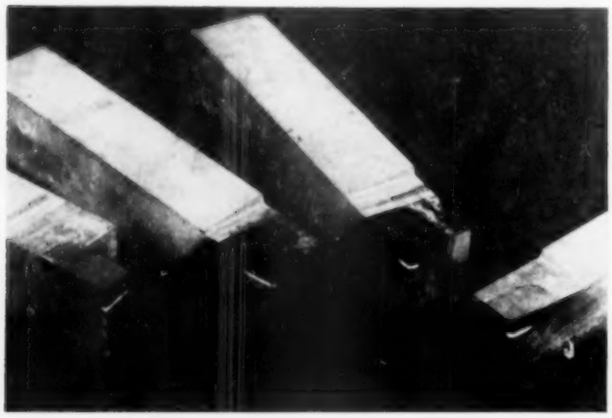
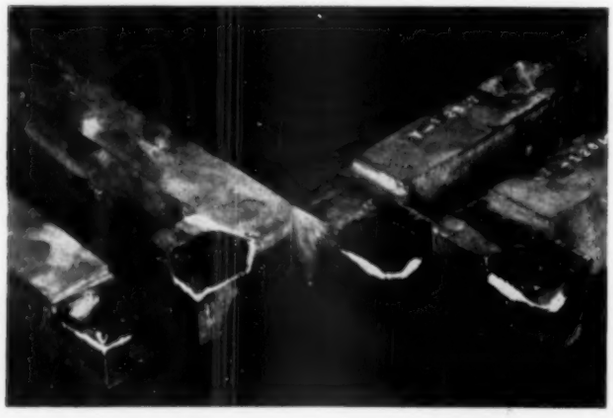


FIG. 10. Photo reveals minor porosity, and shows slight depth which can be removed without greatly affecting tool life.

FIG. 11. Indications produced by defects will vary in brilliance, depending upon the depth and extent of defect. Photo shows extensive porosity and lack of bond.



Wet developer is suspended in water, one pound per four gallons, and will stay in suspension for several hours. It is applied immediately after washing and requires drying in a recirculating air dryer. Parts must be dry before application of the powder developer, which is recommended for tools generally.

Developing time will be similar to that shown for penetration. The most efficient time and procedure for any inspection can readily be determined by experiment with samples from the batch to be inspected. Drying will depend upon the size and shape of the part and may be done by hand, by compressed air or by recirculating air dryer.

Indications produced by defects will vary in brilliance, depending upon the depth and extent of the defect. Fig. 10 reveals minor porosity, and Fig. 11, poor bond. Porosity, in bond, will first show up as a brilliant speck. If there is depth, or an extensive sub-surface area of porosity, the indication will grow in size and brilliance. Fig. 10 shows slight depth which can be removed without greatly affecting the life of the tool. Fig. 11 shows extensive porosity and lack of bond.

This above comparison is worthy of consideration and further study due to a number of difficulties. Under certain processing conditions "shims" and "sandwich braze"—used to eliminate brazing strain and other troubles—may increase the possibility of porosity. Where questionable porosity results, for this or other reasons, the position of such, and consideration of the actual service conditions for which the tool is designed should be the deciding factors. The desirable factors of conductivity of the braze metal and its cushion effect should be compared (in the light of the job to be done) with the important fact that it is also soft and con-

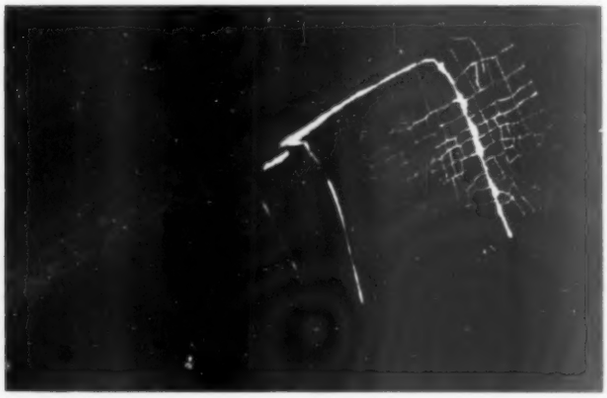
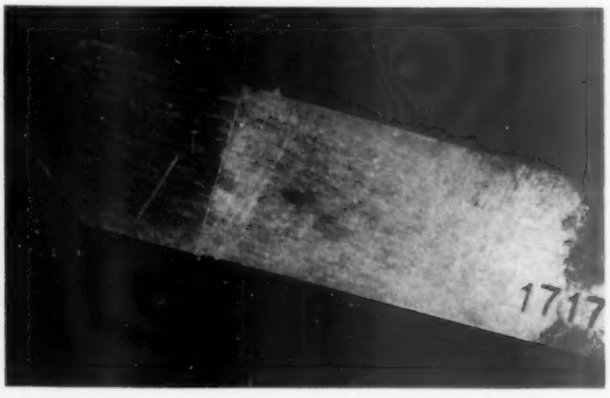


FIG. 12. Large cracks and typical grinding checks.

FIG. 13. Scratch on tool, under normal light, with no crack visible. See Fig. 14, for comparison.



sequently may not provide sufficient rigidity and support for the tip while in service.

Indications of minute checks and larger cracks can also be readily identified. Fig. 12 shows large cracks and typical grinding checks. Since scratches are relatively wide and shallow, as compared with cracks which are narrow and deep, they will not show at all (unless it is desirable, and another technique is used), as the penetrant is removed in the washing operation. Fig. 13 shows a scratch on a tool under normal light with no crack visible. Fig. 14 shows the same tool under black light, with the crack indicated, but not the scratch.

Defects such as those shown in Fig. 15 (rejected for cracks) are probably due to combined brazing strain and rough grinding troubles. While these were rejected due to their directions and locations, it is conceivable that tools with cracks in certain locations, and generally parallel to the principle stress, would give satisfactory service. The value of the tool as compared to the value of the work in process and the danger involved would probably be the deciding factor, but the problem should receive much consideration.

On stellite, Fig. 16, are shown extensive cracks and minute indications extending over one thread only. The former were caused by slight cracks in the rough gage after welding. In the grinding and thread cutting operations following, they extended to their present proportions. The minute indications are grinding checks originating in the final operation.

Fig. 17 shows a drill bit with Zyglo fluorescent penetrant indications, and Fig. 18, a drill bit with Magnaglo fluorescent magnetic particle indications. These are similar to "pickling cracks" and, in this case, were caused by acid attacking areas of high residual stress during macro-etching.

In the carbide and stellite tool fields, it is again fairly obvious that intelligent application of fluorescent penetrant inspection will assist in the production of quality tools at considerable savings. Each step can be controlled efficiently and economically. Brazing troubles can be located at once in the rough, "as brazed," condition. Cracked or poorly bonded tips can be replaced, particularly on cutters, instead of being found after centering and after considerable grinding.

Particular attention can be directed to critical operations such as rough grinding, special shapes, and finish grinding of chip breakers. On stellite, cracks and porosity can be located and repaired by welding in the rough blank state. Defective raw material can be eliminated, as the method will work equally well on steel shanks, blanks, cutter, or gage bodies. In addition, a close watch kept on all processing and salvage operations will result in greatly improved technique, pride in craftsmanship, and decided economies.

With present-day centralized processing, the inspection methods being discussed are neither expensive nor time-consuming. As a matter of fact, equipment may be written off normally, with maintenance and supplies provided, for as little as one-fourth the salary normally paid an average shop employee.

As compared with old-time inspection methods, magnetic particle or fluorescent penetrant inspection are actual time-savers. Tools can easily be inspected, at a similar or faster rate, on manually operated standard units. Production equipment will provide rates up to several thousand per man hour, and the methods are positive. Doubt, indecision, and consequent delays are eliminated, and in addition, the em-

FIG. 14. Same tool as in Fig. 13, but viewed under "black light," with the crack indicated, but not the scratch.

FIG. 15. These tools were rejected because of direction and location of cracks. However, tools with cracks in certain locations and generally parallel to the principal stress can give satisfactory service.

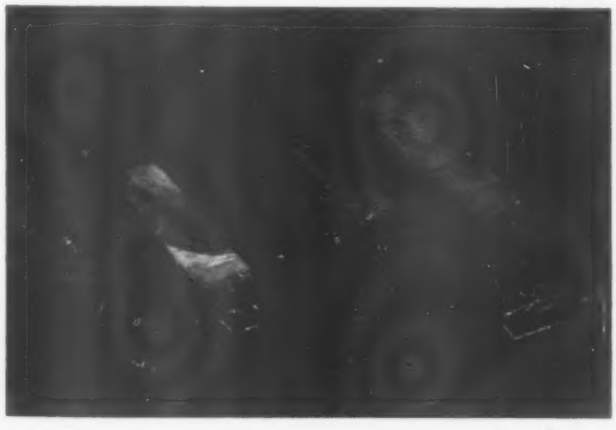


FIG. 16. The extensive cracks on stellite, caused by slight cracks in the rough gage after welding, which were extended to their present proportions in the grinding and thread cutting operations. The minute indications, extending over one thread only, are grinding checks originating in the final operation.

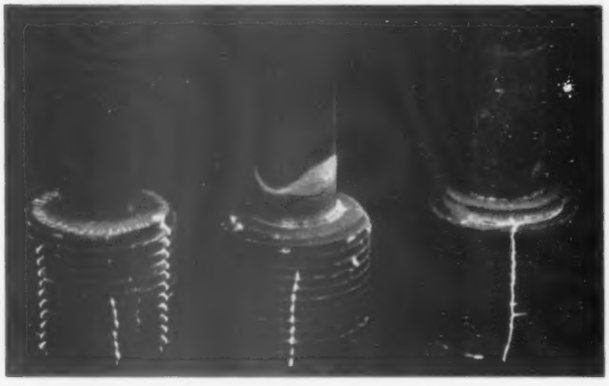


FIG. 17. A drill bit with several Zyglo fluorescent penetrant indications.

FIG. 18. Drill bit with several Magnaglo fluorescent magnetic particle indications.

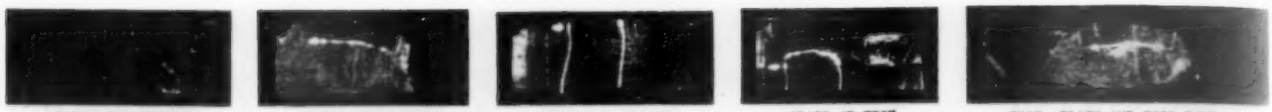


FIG. 19. Scotch tape transfers of indications can be retained for comparison with transfers taken after additional service periods, as supplemental information on the life of cracked or otherwise defective tools in service.

ployment of highly trained personnel for inspection is unnecessary. Training and experience can readily be acquired by shop personnel with proper instruction. At the present time, methods being used in small plants by actual workmen are producing excellent results and considerably improving their skill in such practical problems as heat treat, brazing, and grinding.

As for *control of quality*, in many cases, it should be desirable to keep simple records of quality or of the life expectancy of typical tools. The manufacturer may be interested in plotting the percentage defective on a day-to-day, or lot-to-lot basis. This would present graphic illustration of his quality average; and, any deviation due to an excess scrap trend would be noticed, and corrective measures taken immediately. Similar methods could demonstrate the efficiency of an individual machine or process.

When such charts are properly used, the specialized job knowledge of the practical man is utilized in conjunction with inspection and should result in a greater effort to reduce scrap. The user has the problem of having the right tools available for repeat requirements; for quick decisions, on available types of tools to be used, are often necessary. Here it would be desirable to have charts showing the length of service between grindings as well as the ultimate life of certain types of tools as used for various processes.

Similar charts for individual machines, on regrinding, would greatly assist in selecting proper wheels, speeds, and feeds, and in the elimination of individual pet methods. As supplemental information on the life of cracked or otherwise defective tools in service, scotch tape transfers of the indications could be taken and retained for comparison with transfers taken after additional service periods.

Fig. 19 shows scotch tape transfers. Through them the growth of defects could be studied, and they can be used to determine the life expectancy of typical cracked tools.

Fig. 19 will, therefore, tend to supplement an earlier contention that an inspection method should be used: (1) To eliminate inherent characteristics in the raw stock which will cause trouble in later processing. (2) As a means of continually checking on processing methods to improve technique to assure low scrap loss. (3) To effect procedures that are economical and money-saving.

In a highly competitive tomorrow, the emphasis will be on economical production, with a reduction of waste. The cost of scrap, in whatever form, cannot be absorbed. Instead, it must be added to the selling price of good merchandise if a manufacturer is to remain in business. This cost will be borne by the ultimate consumer. Therefore, salvage operations will receive closer scrutiny, and will be discarded unless they can economically produce consistent results.

Organizations will come to realize that a tool is a few cents' worth of metal which becomes increasingly valuable in manufacture as it is processed, and that processing time and know-how are valuable, though expensive, and must be conserved. Faulty material will be rejected, processes will be controlled, and scrap reduced. Net savings can thus be passed to the ultimate consumer, resulting in increased sales, good will, and added confidence in the product.

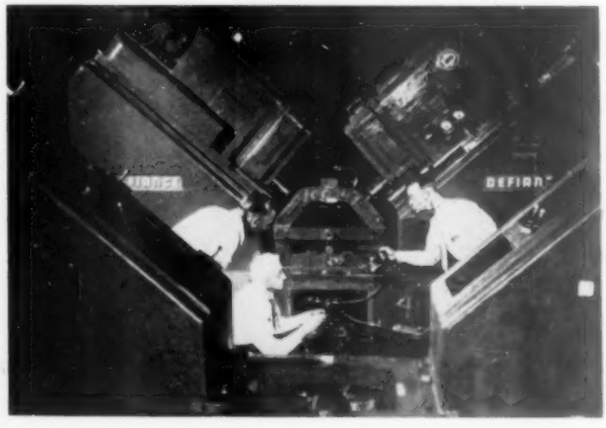
Eight Machines Combine Into One Production Unit

A SERIES OF 8 machines, by Defiance Machine Works, Inc., Defiance, Ohio, handles production machining of valve holes and inserts in the manufacture of V-type motors. Essentially, the machines are No. 37 hydraulic units, mounted in pairs on columns, at the proper angle for machining the valve holes. The machines are aligned, end to end, to make a straight line production unit.

Tunnel-type fixtures are used, with locating pins and clamping arrangements hydraulically operated and automatically arranged so that the locating pins locate the cylinder block before the clamping action takes place. The hydraulic units carrying the cluster heads that drive the tools are also electrically interlocked so that the operator cannot start the cycle of the machine unless the hydraulic unit for the fixture is running.

Operating cycle is as follows: The operator places cylinder block in fixture and, with small lever on front of machine, the cylinder block is hydraulically located and clamped. The operator now presses cycle button, and unit start button, which will cause units to fast travel to the work, feed the required amount (some machines are equipped with an electrical time delay for facing) then rapid traverse reverse and stop. Cylinder block is now unclamped and passed to the next machine, when previous operations repeat.

Machine No. 1 (8 spindles)—machines valve chambers and rough cuts the counterbore for inserts; while machines Nos. 2 to 8 (all 16 spindles) perform the following operation in the order listed: rough bores tappet holes and valve guide hole—semi-finishes valve guide tappet holes; machines valve clearance and semi-finishes insert counterbore diameter; fly cuts valve guide and tappet holes; line reams insert counterbore, valve guide and tappet holes; rough cuts valve seats of inserts; finish cuts valve seats of inserts.



By J. C. Wilson

Crushed Wheel Grinding*

New Tool, Based on Old Principles, Produces Accurate Contours in the Hardest of Metals

PERHAPS NO SUBJECT in the art of grinding has commanded so much interest in recent years as has the principle of so-called crushed wheel grinding.

A recent survey indicated that there are still many people skilled in the art of grinding who are not familiar with the principles of this process. While it has been only occasionally publicized in this country, it is an old principle.** In recent years, through the development of special machine tools to utilize the full advantages of the principle, it has placed in the hands of production men a new tool capable of producing accurate contours in the hardest of materials.

***J. C. Wilson*, well-known authority in the grinding field, has lectured extensively on the design and construction of precision grinding machines. In addition to many other articles, he is author of "Surface Grinding of Precision Contours," which appeared in the September, 1945, issue, *The Tool Engineer*. At present, he is Chief Engineer and Sales Manager, The Thompson Grinder Company, Springfield, Ohio.**

In tracing the history of this principle it has been discovered that it was used back as far as 1884, as patents were issued at that time with claims written around the use of metallic dressing devices. No doubt you have, in your experience, used metallic dressers such as the corrugated cutter or the Huntington type star dresser which works basically on the same principle as the modern crusher dressers.

It would be impossible to give you the complete history of the use of this principle, but an attempt will be made to cite instances that are recorded in patent history. The first use of a crusher roller is recorded in a patent issued to a Mr. Millard in the United States in 1914, wherein he utilized the principle of a corrugated steel roller to produce the grooves into a wood pulp stone to produce a much tougher paper pulp.

The first publicized machine tools utilizing this principle were offered to the market in European countries, and in practically all instances the forms that were produced were of the threaded type.

In presenting our phase of this program the writer would like to say that all of his statements are based on experience in surface grinding and they do not enter into the field of cylindrical grinding. The problems that confront the cylindrical grinder manufacturer in the use of this process are as different as those involved in a discussion of general cylindrical grinding versus flat surface grinding. The loading of the machine structures is different as well as the selection of grinding wheels, and the method of crushing the wheel is also different.

Early Development

Our first experience with crushing dates back to about 1934 when we were manufacturers of machinery for making steel wool. Most of you readers are familiar with the fact that steel wool is manufactured from wire drawn over cutting tools having very fine serrations, ranging from 32 pitch up to 285 pitch. The old method of making these steel wool tools was to form the serration by a single point tool into the steel prior to heat treatment. Naturally the heat treating process produced imperfect serrations due to the fineness of pitch, with the resultant loss of life due to decarburization of the steel.

**Resume of paper originally scheduled for the A.S.T.E. 1946 Semi-Annual Convention, Pittsburgh. Other papers prepared for this meeting will be published in following issues,* The Tool Engineer.

***See "Crush Dressing of Grinding Wheels for Form Tool Grinding—A Symposium" in September '45,* The Tool Engineer. *Also see "Crush Form Thread Grinding—British Method," by L. H. Rhodes, in October '46,* The Tool Engineer.

FIG. 1. In Thompson Truforming, the grinding wheel—powered at slow speed—is fed into the idling work roll with the consequent form of the work roll imparted to grinding wheel.

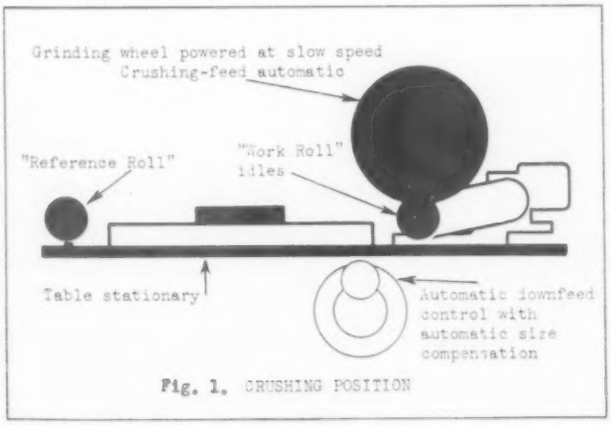


Fig. 1. CRUSHING POSITION

FIG. 2. With grinding wheel powered at grinding speed, production of workpieces proceeds. All measurements are figured from the same "check," which is work height.

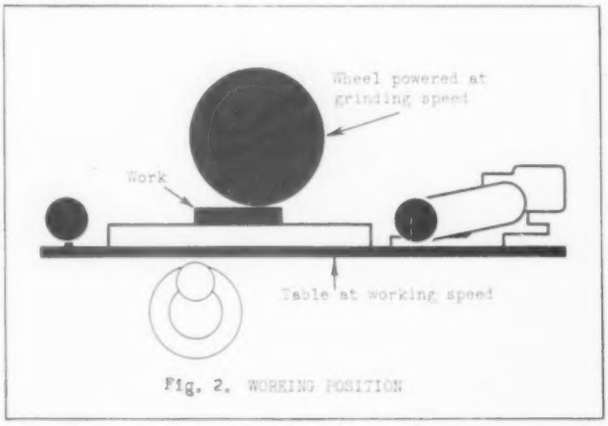


Fig. 2. WORKING POSITION

The president of our company, Mr. C. Baldenhofer, having visited the Lindner plant in Berlin in 1934 where he saw the crushed wheel principle used, thought that it would be a good application to the steel wool tool job, so we manufactured our own crushing device to form the fine pitch serrations into the grinding wheel, and, with fair success.

It is a well-known fact that when the speed of a grinding wheel is reduced from its efficient cutting speed, the bond of the wheel becomes apparently softer, thus enabling the accurate forming of the wheel without the resultant wear of the forming tool.

This principle is utilized in many high grade thread grinders, using diamond dressing tools, to reduce the wear of the diamond. It is also used by the wheel manufacturer in forming grinding wheels initially, by reducing the peripheral speed of the wheel and using a tool steel conical cutter to produce the necessary shape into the wheel. Our early experiments with the process indicated that it had developed far enough for limited production possibilities, but much was to be desired from the standpoint of making it practical to market, due to the fact that the crushing rolls were quite perishable.

Little real progress was made until 1942. We had supplied a few machines on limited basis to manufacturers of serrated milling cutter blades made from stellite. In 1942 we were called upon to give further consideration to the development of this process in the manufacture of turbine blades for gas turbines on a mass production basis.

Early installations studied in the field indicated that wheel supporting members and bearing structures must be more rigid. Another bothersome point was the actual crushing of the wheel, which until this time had been left to the skill of the operator.

Thus, in 1942, we began our extensive development of a completely engineered machine utilizing the principles of automatic crushed wheel dressing, which we call today "Thompson Truforming" when applied to our surface grinding machines. (See Figs. 1 through 6.)

Machine Requirements

It was evident that a machine must be designed with the proper speeds and feeds and the necessary rigidity to bring out all of the advantages that could be obtained with the use of this process. The peculiar thing about the entire process is that it has paralleled the developments of the carbides.

No doubt you will recall the early history of the use of carbides when they were brought to the attention of production minded men and placed upon practically every type and size of metal turning machine tool available.

Most men were of the opinion that here they had the answer to the fast removal of metal, as in most instances it was looked upon as purely a problem of getting the surface speed of the work high enough to rip off the stock without burning up the tool. Little thought was given to the necessary speeds and feeds that were in the machines upon which the carbides had been applied, and, you know the ultimate result. The carbide obtained a bad name. Immediately, however, the machine tool industry started to develop machine tools capable of handling the carbides and even today this development is still growing.

Thompson Truforming machines are equipped with special wheel heads having increased horsepower, and heavier spindles. In all instances ball bearings are used in spindle construction.

We do not wish to convey that it is not possible to crush a wheel on a plain bearing spindle. The ball bearing is used in order to take the thrust of the wheel at the front of the spindle, thus allowing all thermal expansion away from the wheel, which insures accurate alignment with the crusher roll and the workpiece. This also is a factor that reduces wear on the crusher roll. You can readily appreciate that if, in the period of warm-up of the spindle, growth is experienced to the extent that the wheel moves out of relationship with the crusher roll, excessive crushing will be necessary each time the wheel must be trued.

With most of you who have attempted to apply this process in some manner to your present equipment, the old question has come to mind as to whether you should drive the grinding wheel or drive the crushing roll. The answer is simple enough if one realizes that *one* of the elements must idle. The natural one to select is the one which has the least inertia and the least friction in its bearings.

We do not wish to imply that it is impossible to drive the wheel with a crusher roll; but, experience dictates that it is more economical from the standpoint of crusher life to drive the wheel at slow speed, and idle the crusher roll.

On Thompson Truforming machines the spindle is driven at a slow speed by a small geared head motor mounted at the rear of the wheel head, operating through an overrunning clutch.

You have no doubt heard of various peripheral speeds of the wheel from different manufacturers using this principle; and, in general, most efficient crushing can be obtained at any peripheral speed less than 300 surface feet per minute. Some developments have been made which indicate that

FIG. 3. As the wheel wears, approaching tolerance limits, it is trued by recrushing. The work roll redressed the wheel 125 times on the production job mentioned in the text—an unbalanced contour requiring accuracy of .0005 in cobalt steel.

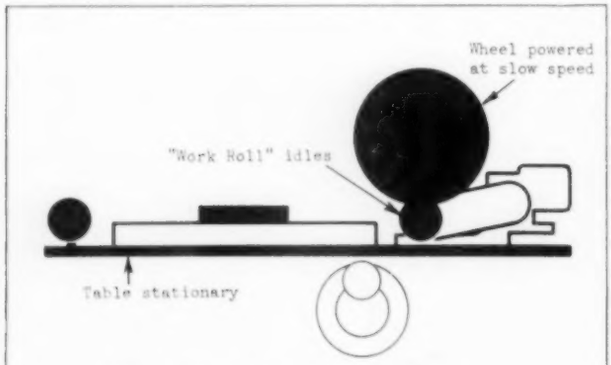


Fig. 3. RE-CRUSHING POSITION (TRUING)

FIG. 4. When the roll, itself, finally wears and loses form, the table is then positioned to conform with this setup, wherein the reference roll (a duplicate of the work roll) is used to dress the original form back into the grinding wheel.

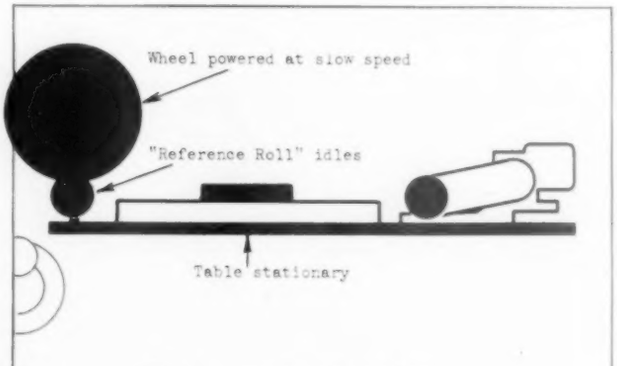


Fig. 4. TOUCHING-UP POSITION

the time is not too far distant when wheels will be crushed at conventional operating speeds of 6000 surface feet per minute.

This has already been tried on a number of jobs, but in most cases excessive wear was experienced on the crusher roll due to the initial start, with resultant increased slippage between wheel and crusher roll.

Table Speeds

Early in the development of this process it was found that many sharp contours could not be produced because of the loss of form in the grinding wheel. This was first thought to be due to off-grading or improper selection of wheels, but after going over the complete range of grades, and grain sizes, as well as variation of grain type, it was discovered that it was necessary to reduce the table speed to prevent the loss of the sharp corners of the wheel.

Thus, it was necessary to engineer a hydraulic table feed into the machine capable of going down to a speed as low as 1" per minute. All of you will probably agree that if it was necessary to reduce a table speed on a surface grinder to 1" per minute, with the so-called conventional depth of cut amounting to .001 to .002, little would have been gained in the use of the crushing process other than the fact that contours could be reproduced that could not be diamond dressed.

We, therefore, immediately experimented with the idea of the single pass method which had been used with great success on cylindrical grinding work, such as you will find in modern so-called "single revolution thread grinders." Thus, it was discovered that great depths of cut could be taken from the hardest steels without burning, cracking, or drawing the workpiece.

We have also taken cuts in high speed steel hardened to 62-65 Rockwell C scale as high as $\frac{1}{8}$" at a table speed of 2" per minute, with complete success. You might wonder why it is possible to take such a depth of cut without burning the workpiece, and the answer lies entirely in the principle of dressing.

No doubt many of you have seen the publicized photo micrographs of crushed dressed wheels as compared to diamond dressed wheels.

The crushed dressed wheel has myriads of very sharp points on the grain, while the diamond dressed wheel has many flats, thus increasing the area of contact between the grain and the workpiece with the resultant friction and heat. Experiments have been conducted on our machines on soft materials using, first, a diamond dressed wheel which had been rough dressed, and secondly, a crushed dressed wheel.

In every instance the crushed dressed wheel cut clean and cool, while in most instances the diamond dressed wheel, with the same depth of cut, would stall the worktable of the machine a short distance after entry into the workpiece.

Thompson Truforming machines are, therefore, equipped with special hydraulic circuits enabling the operator to get speeds from 1" per minute up to 75 ft. per minute. The higher speed is engineered into the machine so that it can be used for regular surface grinding if the operator so desires. There are also many open smooth contours in tough steels such as the cobalt steels, or a steel comparable to Bethlehem "Red Tiger," which require roughing out operations at conventional grinding speeds and the final finish cut taken at the extremely slow speed, thus enabling the operator to get sharp intricate contours if so desired in the toughest materials.

Crushing Devices

All of our crushing devices are mounted on the machine worktable, and two crushing fixtures are used. The work crushing fixture is mounted on the right-hand end of the machine table and the reference crushing roll fixture is mounted on the left-hand end of the machine table. See two photos on next page. The use of two crushing rolls was devised due to the fact that in the initial breakdown of a straight faced wheel to the desired contour, some loss was experienced on the crushing roll due to the increased length of time of contact between the crusher roll and the grinding wheel.

Production requirements dictated that it was necessary to restore the initial accuracy into the roll without removal from the machine. We, therefore, placed the reference crushing roll fixture in the setup which allows touching up the wheel, and the regrinding of the work crushing roll in position without disturbing its initial setting. This also enables the duplication of crushing rolls from the original master.

The use of this setup is quite apparent from the accompanying sketches. The work crushing roll is used for initial crushing and re-crushing of the wheel, and the reference crushing roll at the opposite end of the table is used for touching up the wheel to regrind the working roll to its initial accuracy. Another reason for mounting the crushing devices on the table is that the loading of the wheel, the component parts of the wheel head and machine slides are the same during the crushing cycle as they are when grinding. This eliminates another error that would occur if the crushing was done in another plane.

FIG. 5. Reprocessing position. With the grinding wheel powered at grinding speed and the work roll power-driven, the original form is reground into the work roll. The work roll, disconnected from its power drive and free to idle, is now ready for its second life of 125 productive dressing of the grinding wheel.

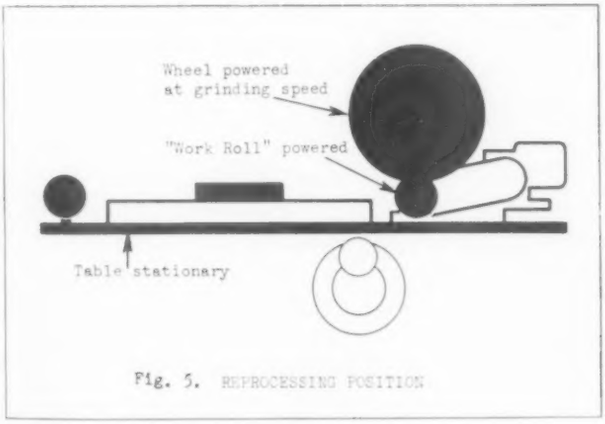


Fig. 5. REPROCESSING POSITION

FIG. 6. Reference roll, on the job mentioned in the text, was used 125 times to reprocess work roll, and since the work roll was capable of dressing the grinding wheel 125 times before needing reprocessing, a total of 125 x 125, or 15,625 production dressings per one work roll was possible.

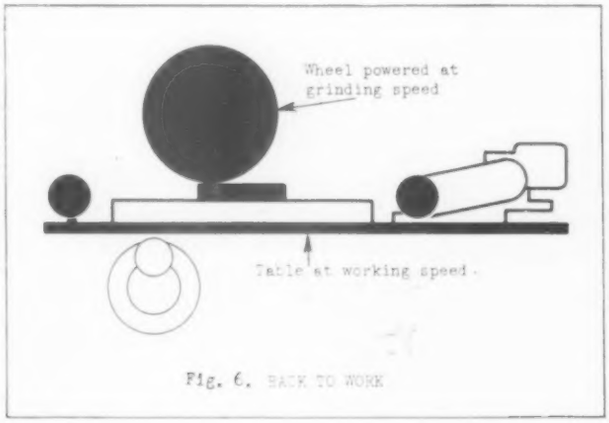


Fig. 6. BACK TO WORK

With the crushing fixtures on the table, this also allows all measurements—starting position of the wheel for down-feed limits for crushing, grinding, or re-crushing—to be figured from the same "check," which is the work height. Thus, perfect alignment is assured at all times, which is absolutely necessary in producing the finest of precision work. All automatic size compensation and automatic truing cycles are interlocked with the grinding wheel, and its position with respect to the table.

Crushing Rolls

Crusher rolls have been made of practically all types of materials—from the softest to the hardest. Most of our crushing rolls are made of ordinary 18-4-1 high speed steel hardened to Rockwell 62-65 C scale. Good results have also been obtained on short runs with fairly close tolerances when the roll was made of close grain Meehanite. In fact, some users of our equipment have standardized on the use of Meehanite crushing rolls, using flat form tools for reconditioning crusher rolls, rather than make two hardened steel crusher rolls.

Some people wonder why we do not attempt to use some of the extremely hard tool steels, or the carbides for crushing rolls. The answer is usually—how much does it cost to put the initial form into the crushing roll, and can it be readily reground in position without removal from the machine?

Most of the extremely tough materials require different wheels for grinding the form into the crushing roll, while 18-4-1 high speed steel can be readily ground with the conventional wheels used in grinding production parts.

With the Truforming process, using two crushing rolls, and the simplicity of restoring the initial shape into the roll, it is not necessary to go to the great expense of endeavoring to put the initial form into an extremely hard material.

Much has been said relative to the various methods of relieving the crusher roll to permit the removal of abrasive parts which apparently are crushed from the wheel when forming. The only time we have found that helical gashes or slots, which are irregularly spaced about the periphery of the crusher roll, add much to the life of the roll is on extremely out-of-balance forms, or contours of considerable depth.

In general, most of our crushing rolls are made without any gashes as we do not feel that the extra expense of applying the gashes adds enough to the increased life of the roll, especially when it is possible to regrind the roll rapidly.

In engineering the design of a crusher roll, one should keep in mind that the form should be presented to the wheel in as near a balanced condition as possible. A balanced form is one that is symmetrical, or in such a position that the two edges of the wheel are approximately in the same plane, such as a thread form.

Straight side wall work can be ground, but in most instances we desire to have the straight side wall positioned approximately 4° off a vertical plane with the table, to enable us to regrind the roll without removing excessive stock.

In the manufacture of crushing rolls, great care should be taken to be sure that the bore of the crushing roll is to an accurate dimension to fit the crusher spindle, and that the sides are absolutely square with the bore. If these precautions are not taken, an error will occur in the crushing; and, in some instances on extremely fine pitches of thread forms, practically no form at all will be reproduced into the wheel.

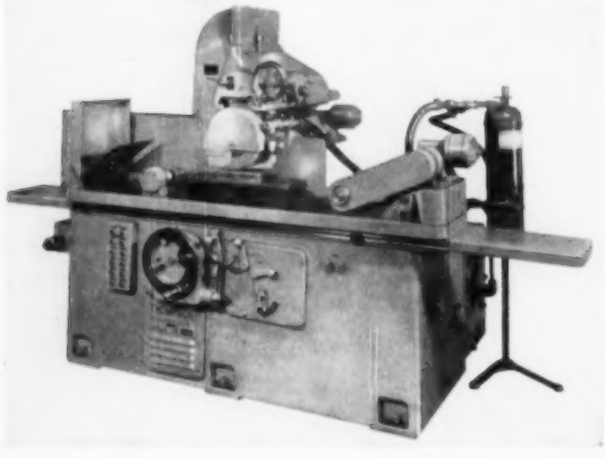
Coolants

Great care should be exercised in the selection of the proper coolant when utilizing the principle of crushed wheel grinding. Many people believe that it is possible to use conventional soluble oil for this operation, but our experience has dictated that a very limited number of forms and types of material can be ground with conventional soluble oil.

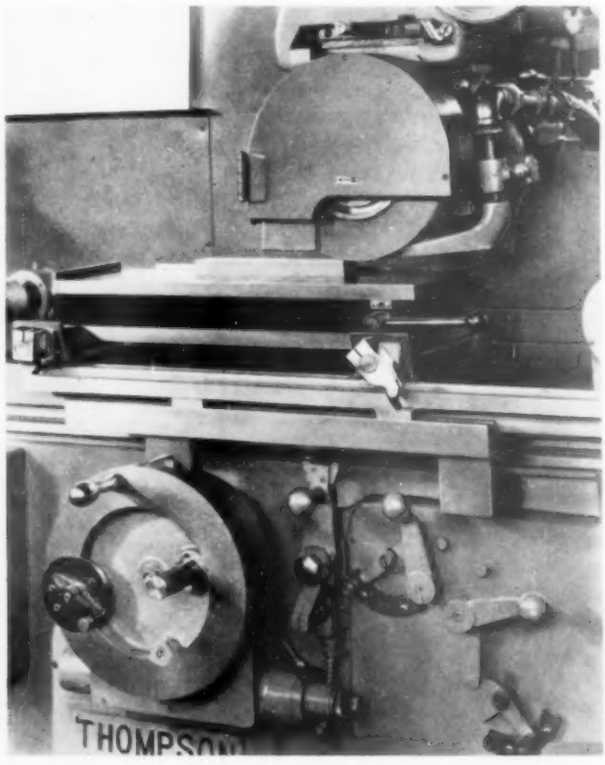
In most instances we recommend high grade thread grinding oil having a viscosity of about 300 seconds at 70° Fahrenheit. Most of the thread grinding oils that we use have considerable additives to produce extreme pressure qualities as well as to reduce the mist or fog that is generally experienced in the use of thread grinding oils.

In all cases, we recommend the finest of filtration, not only from the standpoint of obtaining high finishes, but for increasing the life of the crushing roll, as well as increasing the number of pieces obtained from a single crushing of the wheel.

Engineered unit designed for mass production of contour work.



Close-up of a unit for continuous work by Thompson Truforming.



The coolants must be applied as closely to the point of contact, between the work and the wheel, as possible. In most instances approximately 5 gallons of oil per minute per inch width of wheel is required.

On extremely accurate pieces, such as roll thread dies, lamination dies, and comparable parts, the coolant should be temperature controlled, since we are all aware of the fact that oil does not readily give up heat that is generated from the grinding operation.

Grinding Wheels

Proper selection of grinding wheels is a most important factor, especially with the most recent advancements in the development of high speed steels.

To date, however, not much success has been made in the crushing of the so-called "plastic bonds" such as resinoid, shellac and rubber. This is apparently due to the resilience of the bonds and the inherent quality of packing or wedging when compressed between the crusher roll and the grinding wheel. There is little doubt that developments now being made will sooner or later permit the use of the plastic bond.

To date, however, all of our experience in crushing has been with vitrified wheels, made of either aluminous oxide abrasive or silicon carbide.

The majority of our aluminous oxide wheels are of the regular type material and not the refined material. The crushed principle seems to require a toughness of grain, rather than friability.

All of our wheels are of fine grain structure and very soft grading. The grain sizes range from 120 grit to 500 grit, depending upon the intricacies of the contour to be ground. Gradings range from F to grade K on the universal grading scale. Both porcelain and glass bonds are used, but better results are obtained from glass-bonded wheels. Structures are well on the open side in pressures ranging from 500 lbs. to 1500 lbs. per square inch.

No wheels should be used that have lead centers, as the amount of pressure that is exerted between the crusher roll and the grinding wheel will necessarily distort the lead bushing. If at all possible, the wheels should be left mounted on the wheel mounts when removed from the spindle of the machine.

This is not always possible, however, which accounts for our establishing a definite reference point for the shoulder of our crushing roll, and the position of the grinding wheel with respect to the crushing roll, so that if a form is desired to be stocked it can be mounted on the wheel mount of the machine and re-crushed with a very light dressing operation.

Some people have recommended the soaking of wheels in the coolant for a period of time prior to use. We have found no advantage in this soaking process.

Conclusions

Many people have asked us this question: What accuracy can be obtained by the crushing process? From our experience, we would say that the accuracy that can be produced initially in a crushing roll can be definitely *reproduced* into workpieces on a production basis.

Another question that frequently arises is: How long does a crushing roll last? This is a variable question and can only be answered by stating that it depends a great deal upon the type of material being ground, the accuracy required, which is a definite function of the frequency of re-dressing the wheel.

The life of a crushed dressed wheel on a surface grinder is not as long as is experienced on the crush dressed wheel when used on cylindrical grinding. The reason for this is that the wheel is in contact with a flat surface—which means a longer chip with a resultant lapping of the grain—which in turn dulls the wheel.

A production job, on an unbalanced contour requiring an accuracy of .0005" in cobalt steel, was given a roll wear test under actual working conditions. Eight forms were produced per wheel crushing. The depth of the form was .180". The working roll was used 125 times before regrinding was necessary. Utilizing two crushing rolls, as previously explained, 15,625 crushings could be produced. See Figs. 1 through 6.

In our experience it has not been possible to attain as high a finish on workpieces with the crush dressed wheel as we have with a diamond dressed wheel. We do not believe that this is all attributable to the method of dressing the wheel. We believe you will all agree that a plunge grind does not produce as high a finish as one that has been ground with a traverse of the wheel.

It can be readily understood that it would not be possible to attain as high a finish with a crush dressed wheel as with a diamond dressed wheel, since it is not possible to flat the grains of the wheel for finish grinding in any other way than allowing the grains to dull themselves by coming in contact with the workpiece. This would naturally result in heat and distortion of the workpiece as well as a reduced production.

You may ask this question: Can a particular piece be produced by the crush grinding process? The measure is always—can the piece be hobbed or form milled? If it can, then there is no question but that the piece can be crush form ground.

In conclusion, we must observe that the developments of this process are still going on. We feel that this principle will definitely fit into the realm of high production as a tool to be considered in the realm of high speed milling or broaching. The machines, manufactured in a range of sizes and types, can be equipped with fully automatic feeding cycles the same as are found on milling machines and many other automatic machine tools.

On-The-Job Annealing

Often, during spinning operations, the metal being spun becomes work hardened. To eliminate this loss, in production, tool engineers at the Westinghouse East Pittsburgh Works arranged a gas torch near the work, with the flame controlled by a foot pedal. Only a pilot light burns until the operator steps on the pedal, thus preventing burning of the work.

By A. A. Goodman

Tools and Statistical Quality Control

In Which Statistical Control Analysis Leads to Better Methods and Equipment

STATISTICAL Quality Control, that young but lusty and fast growing member of the Quality Control family, can, if given but half a chance, be of real service to the tool engineer.

Primarily, because of the term "statistical"—which is always viewed with suspicion and apprehension by the majority of people—the system is not, as a result, warmly welcomed. Personally, the writer is sorry to see the term "statistical" attached to the control chart technique since, if anything, it hinders the popular acceptance of this tool of Quality Control, in the same way that originally naming the animal a muskrat instead of a marsh rabbit has, by inference, deprived many thousands of people of some mighty good eating.

A. A. Goodman **"served his time" with the Brinton Machine Company as one of a vanishing group of $6.00 a week apprentices. He was inspector with RCA-Victor Div'n, later Service Instrument Co. and Westinghouse Electric Corp'n, where he saw the transition of an inspection department into a Quality Control Division. He is now Div'n Supervisor in Charge of Process Control, the Gage Laboratory and Statistical Quality Control, Westinghouse Steam Div'n.**

When an operation in our plant runs into difficulty, we usually make a statistical analysis of the job as a means of ascertaining just where the trouble lies. The cause of such difficulty can lie in any one of divers categories, however, experience has taught us that one of these is the machine or its tools. In such an event, we immediately contact the tool engineers and acquaint them with our deductions for action. Such interdepartmental cooperation eventually leads to a smoother flow of production at a high quality level.

It may prove beneficial for tool engineers to keep a "weather eye" on statistical control analyses for information that may lead to improving of methods and equipment.

Two examples, taken from our files, are indicative of the close tieup that Statistical Quality Control can have with the tool engineer.

Example No. 1. The elimination of tool breakage by (a) statistical analysis at the point of breakage and (b) subsequent control setup at the actual source of the trouble.

FIG. 1, Left.

The shop had been annoyed for some time by the unwarranted excessive breakage of eight inch convex milling cutters on a comparatively simple operation. See Fig. 1. In this operation, ten stainless steel blocks, two inches long by .812" ± .001" thick, were inserted end to end in a jig, locked by pressure on the .812" dimensioned faces, after which a concave cut was taken in one pass. From time to time, during this pass, a block would lift out of its rest in the holding jig, wedge itself against a tooth in the cutter—and, the inevitable result was a broken cutter! The shop asked for help by a statistical analysis.

Consultation with the operator revealed that the difficulty evidently stemmed from a previous grinding operation that established the .812" dimension. The extreme range in size, of the block width, is supposed to be kept within a total drawing tolerance of .002" inch, but it is the experience of the milling operator that many of the blades submitted to him vary by as much as twice the specified tolerance. As a consequence, he gages all pieces before putting them into the jigs in order to protect himself against getting blocks whose widths vary excessively.

A Question of Tolerances

A test on the jig readily showed that if the variance of any middle blade, in a sequence of three, was minus .003"—or more—than both of the end blades, that the middle blade would dislodge itself in the milling operation and break the cutter. This is shown in Fig. 2. It was accordingly decided that the points to be investigated were: (1) Within what limits are the pieces actually being ground? (2) Within what limits can the pieces be ground?

In order to get some idea of the variability of the product as it was reaching the milling operation, two trays of ground blocks were selected at random and fifty blocks were picked at random from each tray. It was found that for tray 1, σ = .00044" and for tray 2, σ = .00056". In other words, one can fully expect to get an average σ of .0005". We may, therefore, expect to get all but 3 out of 1,000 blades to fall within $\pm 3\sigma = \pm$ .0015" or within a total tolerance of .003".

It can furthermore be shown that, whereas the drawing calls for producing all pieces within .002" limits, we can expect to find 5% of production outside the limits—i.e., fifty out of every 1,000 pieces will be outside tolerances. In any case, getting 50 out of 1,000 pieces outside of drawing limits is unwarranted in the first place, and the problem of broken cutters would be nullified if we could bring the operation into control.

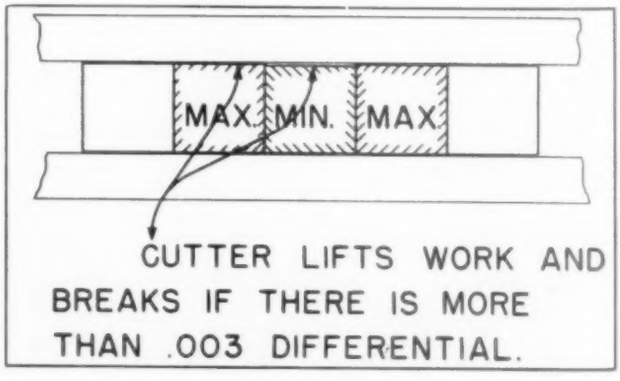


FIG. 2, Right.

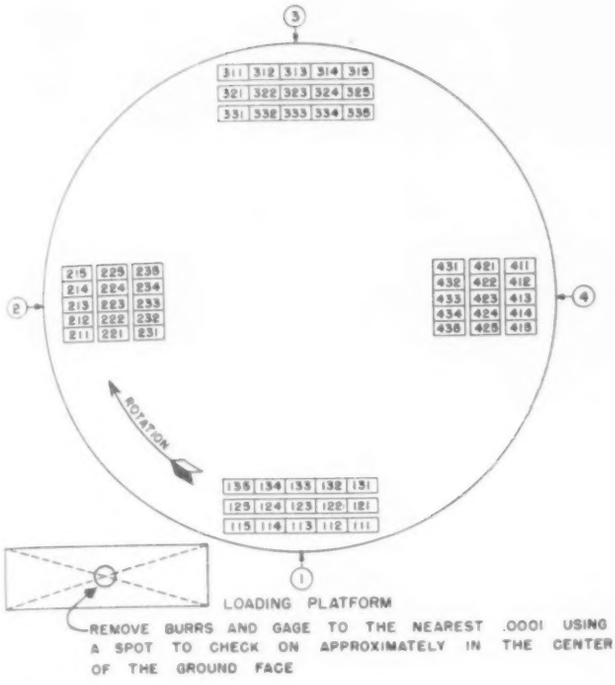


FIG. 3.

In order to get an answer to the second question, three tablefuls were run under control and the samples were taken in accordance with the procedure suggested by the illustrated diagram. These samples should adequately describe the distribution of blade sizes after grinding. See Fig. 3.

A statistical analysis was made of the data collected from each table and these data may be summarized as follows:

Table	$\bar{X}$	σ
1	.8125"	.00017
2	.8124"	.00021
3	.8126"	.00024
Combined	.8125"	.00024

Translated into "English," this simply means that all but 3 out of 1,000 pieces will fall within a tolerance of $\pm 3\ \sigma = \pm .00072$ or within a total tolerance of .0014". Since the actual allowed tolerance is .002", it is clear that the blades can be manufactured well within the drawing limits which would at the same time eliminate the cause of cutter breakage. Note that the sigma in the controlled operation was approximately one-half that of the uncontrolled run.

If work were produced with the variability found in the controlled tablefuls, then we can be certain that there will be no trouble in fitting the jig properly. If the quality of ground blades were maintained at this level, then there would be no need for segregation by the operator on the milling machine.

This experiment has shown conclusively that it is within the power of the operator to produce well within tolerances on the grinders. It has also been shown that the work coming from the grinders was not satisfactory because of excessive variability. Therefore, a *control was placed on the grinding operation at once*. The control aimed at the level which was maintained during the experiment.

In essence, such control has two fundamental aims. In the first place, $\bar{X}$ is held close to the center of the specification band. In the second place, a control is placed on the variability of the lot. It proved convenient to measure variability in terms of extreme variations.

A simplified chart—Fig. 4—for ascertaining the $\bar{X}$ and $\bar{R}$ from a sample lot of twenty-five (five groups of five samples) was devised, predetermined limits of $\bar{X}$ and $\bar{R}$ were printed on these charts and the Quality Control Personnel were allowed to accept only those lots that fell within the limits as set up. This chart, which is illustrated here, has proven of utmost worth in connection with personnel not too mathematically inclined.

Previous Faults Eliminated

The setup as described worked beautifully. The grinding operation was brought into control within twenty-four hours and has consistently been held in control. The milling operation had two obstacles eliminated: first, the necessity of the operator gaging each piece individually before insertion into the jig and secondly, the breaking of the milling cutters due to the too great variability of the .812" dimensioned locking size. The final result of interest to the tool engineer, in this case, was that it absolved him of any criticism that the operation was not tooled up properly.

Example No. 2. The significance of variance between jigfuls and within jigfuls. On a compound milling operation in which three nested cutters machined five surfaces, two of which were held to a tolerance of $\pm$ .0005", trouble was encountered. Rejections ran so high that, even after reworking, 15.4% of the production was scrap. Prompt action, to ascertain the cause of trouble and to remedy it, was imperative.

FIG. 4.

GRINDING

S.O. _____ DWG. _____ PC. NO. _____

LOT _____ MACH. _____

OPER. _____ TIME _____

INSP. _____ DATE _____

REMARKS:

DRAWING SIZE _____

	1	2	3	4	5	=6	7	8
GR.1								
GR.2								
GR.3								
GR.4								
GR.5								
TOTALS								
AVERAGE (DIVIDE TOTALS BY 5)								
LIMITS—SINGLE TABLE							± .0003	.0000 to .00065

Follow sequence as given below:

1. Segregate work in groups of 5.
2. Enter size of each piece in proper column. (Size to be in .0001.)
3. Add each group—enter total in col. 6.
4. Divide col. 6 totals by five and enter results in col. 7.
5. Get extreme variations in each group—enter in col. 8. Note: Count +2 to +3 as 1; —2 to +3 as 5; —3 to —2 as 1; etc.
6. Add column 7 and enter as total.
7. Add column 8 and enter as total.
8. Divide each of the above totals by five and enter results in average squares.
9. Compare averages with figures given in bottom square. If they fall outside the limits, notify your supervisor.

The ± .0005" dimension—See Fig. 5.—was reportedly varying in size approximately .004". The operation was badly out of control. We thought it best to run a series of tests to check for a significant variance between tablefuls, between jigfuls and within jigfuls. As time was the criterion, we ran a simple test between tablefuls with some positive results; however, the magnitude of the variances uncovered were very small compared to the 15.4% defective we were hunting. The trouble, therefore, was clearly either within jigfuls or within the various positions in any one jig or both.

A series of controlled tests were run on 328 blades. After the first 117 blades, the speed of the machine was raised from 57 to 87 RPM for better finish. The set-up operation and any other data found of interest was noted.

The sizes from the data sheets were tabulated and the overall picture showed that the $\bar{x}$ was .0004" over drawing nominal. Extremes ran from .0025", under tolerance, to .0018" over tolerance—or a total range of .0053" on a total drawing tolerance of .001".

Jig patterns repeated themselves in a ragged sort of way. Variance was found amongst jigfuls due to two different types of feeding the work to the cutter (conventional and climb). Variance within jigfuls, however, was the one predominant cause of the scrap level of 15.4%. A reprint of the report to the shop, which follows, can better illustrate the procedure used to localize the difficulty and our recommendation for same.

Report on Peg Milling Operation, Pin Type Blades

A series of tests were run on 328 blades. The $\bar{x}$ was + .0004" and the range was .0053". Defectives were better than 20% and reworkable defectives (scrap) was 15.4%. We found that: (1) The milling machine had a flutter or runout of .0015". When our total tolerance is .001", this is obviously too much. (2) The setup was too haphazard. A three cutter setup, using spacers under variable tension for final size, is employed. As the tolerance of this size is ± .0005", it is the worst kind of practice; the setup is too flexible. Any of the attached charts will show this condition as no two consecutive blades finish to the same size.

Data Sheet

SO 5-A-1602	Part 20-F-806	Mach. No. 162
Item 2	Oper. O.T.B.	Date 7-18-44

Jig Position	LH 7	RH 8	LH 7	RH 8	REMARKS
1	.3090	.3117	.3091	.3118	
2	105	120	112	120	
3	112	115	116	123	No Set Up Change
4	118	119	109	124	
5	121	124	120	121	Speed - 87 R.P.M.
6	124	118	113	123	
7	118	125	116	121	Feed - 1.8 in/min
8	120	127	120	121	
9	119	121	117	128	
10	128	123	119	115	
11	123	122	118	119	
12	122	124	123	119	
13	124	124	117	126	
Jig Position	LH 9	RH 10	LH 9	RH 10	REMARKS
1	.3096	.3120	.3110	.3114	
2	109	124	120	128	
3	115	124	116	118	No Set Up Change
4	115	125	114	128	

FIG. 6.

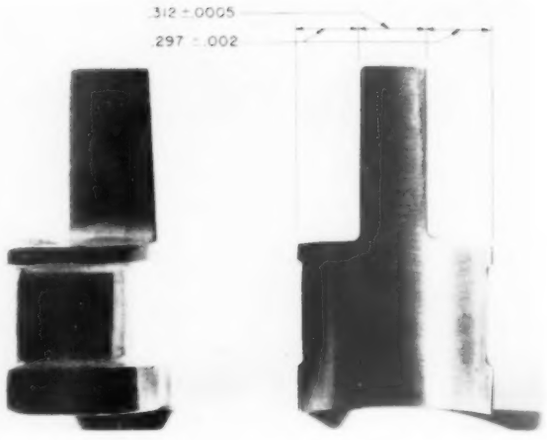


FIG. 5.

(3) Two jigs are employed. One cuts while the other is being loaded, therefore, one climb mills while the other one uses the conventional milling cut. It was the consensus of opinion that the worst work was being obtained from the climb milled jig; however, a glance at any of the charts will show that nothing is further from the truth. The climb milled jig (right hand jig) gives us a better all around product and is responsible for none of the scrap. See Fig. 6.

Note, especially, that the first four positions in the left hand jig are always cut under drawing minimum. *Here is the one big reason for the scrapped work.* The probability is that the flexible cutter setup, as it leaves the work on the conventional cut, closes up the spacing between the cutters and the result is undersize work. See Fig. 7.

It might be mentioned, in this connection, that the operator is seating the work in the loading jig with a ball pein hammer. As the machine is cutting while the table is being loaded, one can assume that striking the table while the machine is taking a finishing cut is hardly conducive to holding close tolerances.

(4) Neither the operator nor the setup man has the proper conception of what they are trying to accomplish. As long as the blades are around the drawing size, everybody seems to think it good enough. All seem to be trying for average size and not caring too much about individual size. (May we point out here, the danger of averaging by unqualified personnel?)

Recommendation

(a) A solid, one piece cutter, using tantalum carbide or tungsten carbide inserts (Fig. 8), should be employed. This will furnish the necessary rigidity and the hard inserts will hold the size longer. A speed of 200 rpm and a feed of 3.4 in./min. is suggested. The solid cutter should eliminate the variances within the jigs, especially in the left hand jig.

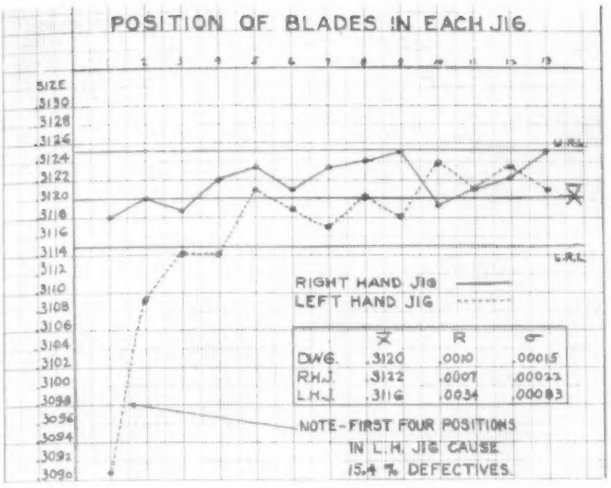


FIG. 7.

(b) One long jig holding thirty-five or forty blades to be used instead of two smaller jigs. This will eliminate variance between jigs. Climb milling should be used as on this job it gives a more uniform product.

(c) Two precision setup blocks, one for each end of the jig, should be used for centering the cut. These blocks should be furnished size less .020" and are to be used with feelers to set the cutters to straddle the center line of the holding jig.

(d) The machine for this work must be in perfect condition. All gibs, thrust bearings, ways, arbor, etc. should be checked at once and adjusted where necessary.

(e) The operation is both out of control and out of date with regards to modern machine shop practice and should be brought into line simultaneously as each will affect the other.

(f) We are immediately installing a control chart on this operation to eliminate defectives and to bring the operation under control. Cooperation from the shop will be appreciated.

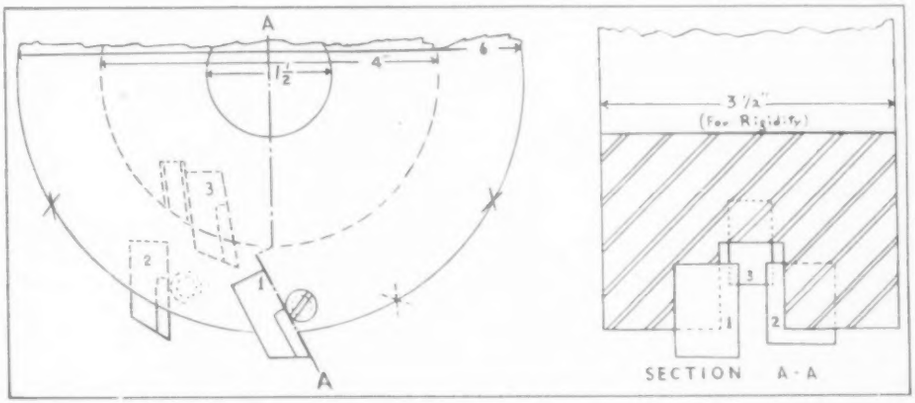
END OF SHOP REPORT

In this case, the report to the tool engineer carried a history of what we had, why we had it and our recommendation for overcoming the trouble. It is not our intent to insist that our recommendations be followed; what we are interested in, primarily, is getting an operation into a satisfactory quality level. However, inasmuch as a considerable amount of time and shop "know how" was expended by our department in the analysis, and statistics were only then applied to cinch the matter, it is only logical to avoid a repetition of the same groundwork by another department. We believe that the items outlined in our reports are sufficiently comprehensive in scope to give the tool engineer a good basis from which to make his own further deductions.

These two examples indicate that the value to the tool engineer of the analyses submitted by the Statistical Control branch of Quality Control is twofold. In the first instance, in the event that an operation is in difficulty and that difficulty is not due to faulty tooling, the analysis will back him up on his contention and quickly remove the complaint from his agendum.

On the other hand, should the difficulty stem from the tool or methods department, at least it points a definite finger to the cause of the trouble. The primary step towards the curing of a physical illness being the diagnosis of the cause, by the same token the restoration of a production ill can well start with a statistical diagnosis. Everything considered, then, the writer believes that the tool engineer may profitably avail himself of this service because such analyses, augmented by his more extensive tool background, may prove to be a preferable basis of action for the lucid and rapid handling of shop complaints.

FIG. 8. Recommended jig cutter for peg milling operation on pin type blades. Tantalum Carbide or Tungsten Carbide Rectangular or Lovejoy Inserts. Pitch—outside (6") cutters, 3 inches; pitch—inside (4") cutters, 2 inches.



Training Programs Up 164%

JUST ONE YEAR after V-J Day, over 68,000 establishments employing skilled labor had registered apprenticeship programs in full operation. This is a 12-month increase of more than 164%, according to Wm. F. Patterson, Director, Apprentice-Training Service, U. S. Dep't of Labor.

This increase can be explained by the fact that in the depression some branches of industry lost sight of the need for training apprentices for normal production; and, during the war, the armed forces took away most of the potential apprentices. It is generally believed that the resultant postwar scarcity of skilled workers has, and will continue to stimulate industry to set up apprenticeship training in anticipation of record production.

New Absorbent Available

A NEW OIL, grease, and water absorbent, produced from a unique alumina silicate material and capable of absorbing from 120 to 140 per cent of its own weight, will shortly appear on the market.

Used on oily, greasy, or wet floors, the absorbent greatly reduces danger of accidents due to slipping, at the same time keeping floors clean and thereby minimizing chances of flash fires. Announced by the Blue Mountain Clay Co., Inc., Memphis, Tenn., this granular absorbent material is dust free and nonabrasive, and will be "tailor-made" to give maximum service to the user without sacrificing its absorption qualities. Weighing up to 30 lbs. per cu. ft., it is claimed by the manufacturers to give a greater coverage per pound.

By A. M. Sargent

What Price Airplanes?

Successful Techniques in the Mass Production of Aircraft Facilitated by Modern Tool Engineering

A BRILLIANT CHAPTER in the history of American ingenuity and production was written by U. S. aircraft manufacturers from 1941 to 1945. One of the most hopeful signs in the industry today is the indication that many of these manufacturers are applying the practical knowledge gained in writing this chapter to the production of private and commercial airplanes, the result of which will be more and better civilian aircraft for less money.

Mr. Sargent

By no means, however, can they apply all of the principles of military airplane production to manufacturing for private consumers. In producing for war, little regard was given to costs, which were constantly accelerated by the endless evolution of design. The military market was established and, therefore, a manufacturer usually knew, within reasonable limits, how many of a given model he would produce. If a design was discontinued or altered, it was the Government that bore the cost of tooling and other expenses for giving birth to its successor.

Today we are facing a new set of circumstances. But many of the advancements made in production will apply. Probably the greatest of these lie in tooling for production and the many applications of tool engineering to nearly every phase of parts-making and fabrication.

Tool engineering is the practical science of mass production, the fundamental purpose of which, applied to any industry, is to reduce the cost of the finished commodity produced by that industry. It is a manipulation of economics in that the Tool Engineer must determine with what tools a given number of identical units can be most economically produced.

Evidences of mass production and the applications of tool engineering to aircraft manufacture appear daily.

Many lightplane manufacturers are now hitting production rates of 40 to 50 units per day. Indications are that these figures will be stepped up as soon as conditions warrant greater volume.

One manufacturer, now moving into mass production, has announced that, through tooling and simplification of design, he has been able to reduce the selling price of a current-model, new personal plane from $15,000 to $3,900.

Another milestone was the setting-up, in 1945, of the first mechanized conveyor assembly line for the production of personal airplanes. Timed to produce 20 planes a day, this pioneer production line was originally 1275 feet long. It has since been enlarged.

At this point, it would be reasonable for someone to ask, "What constitutes mass production?"

It is impossible to set an arbitrary figure of unit production at which an industry can be said to have reached mass production. Being entirely a relative thing, applied only to the production of uniform articles, its true meaning can be shown best by example or comparison.

The Auto Parallel

During 1941, the last "normal" year of automobile and airplane production, a single automobile manufacturer produced well over a million cars of the same make. In the same period, the entire aviation industry produced only 26,277 units, 6844 of which were civilian and 19,433 military. The total production of the automobile industry for 1941 was 4,838,561 . . . and this is not the largest year on record. However, 1941 is the largest year on record for civilian aircraft production.

In the concept of the Tool Engineer, the 1941 output of the aviation industry could not be termed "mass production." He would term the products "hand-made jobs," or the manufacturing "tool-room production," or perhaps "pilot-line production." This is especially true in view of the fact that the 26,277 airplanes were produced by some hundred or more manufacturers. The nearly five million motor vehicles consisted chiefly of 17 makes of passenger cars, and three major manufacturers accounted for nearly 90% of the total volume.

Several aircraft manufacturers approached or attained a type of mass production in 1944 when the production of military units reached 95,237 for the year—the largest single year on record for aircraft output.

This mass manufacturing, however, differed from automobile mass production in several important respects:

First—When an automobile design is decided upon, it remains fixed throughout the manufacture of a given model. Any minor improvements made on the model during its production have little or no effect on the costly tools, dies, jigs, fixtures, and special machines used in the manufacturing process. Until now, airplane designs were not fixed and, in many cases, changes were made constantly which either made the use of certain types of high-production machinery infeasible or required constant altering and replacing of the production machinery that was used.

Second—With public demand for airplanes being only a fraction of that for automobiles . . . and the volume that does exist being divided among many manufacturers . . . no airplane manufacturer can afford to tool up in the same manner that the automobile manufacturer does. If we could begin with the premises that the airplane design is fixed for the duration of the model and that 5000 of the units will be produced, that still might not justify such tooling. A complete set of dies and tools for the airplane, of the type used by automobile manufacturers, would probably cost more than the total value of the 5000 planes.

Third—After many years of experience, the automobile manufacturer can predict with a reasonable degree of certainty about what the total automotive market will be, 18 to 24 months in advance. He also knows, within fairly well defined limits, about what share of the total market he will enjoy. Hence, he can apply his economic formula to the general business index and determine what type of tooling is most economical for his particular operation at a given time. The sale of an airplane depends on so many other factors, at this stage of its market development, that no such predictions are possible within nearly the same limits as for the automobile manufacturer.

About the Author

Albert Marden Sargent, president of the American Society of Tool Engineers and chairman of the board of Pioneer Engineering and Manufacturing Company, learned the science of mass production by growing up with the automotive industry.

A master of design, mass-production methods, and industrial cost-cutting techniques, Sargent devoted most of his time in World War II to the tooling-up of aircraft companies.

He was born at Gilmanton, N. H., in 1898. After working in various New England shops he moved to Detroit in 1919 where he served with Chevrolet, Lincoln, and Burroughs Adding Machine Co. During the depression he formed the Pioneer Engineering & Manufacturing Co., and later the Pioneer Pump & Mfg. Co. and Pioneer Industries.

With the transformation to mass production of the civilian aircraft industry already under way, Tool Engineers serving the field are highly aware of the above three obstacles. They are rapidly finding ways to meet and hurdle them.

Studying the many parallels of automotive and aircraft development and production, it is reasonable to conclude that production of airplanes will follow somewhat the same general pattern as that set by the automobile industry. The growing pains the aircraft industry is experiencing now are similar to those of the automobile industry at the same relative stage of development. Due to the many techniques that can be borrowed from the automotive industry, the process of production evolution should be faster.

Aircraft-design engineers and Tool Engineers, working together on lightplane production, have decided that there will be fewer design changes of the kind that interrupt manufacturing and make special tools obsolete.

They have determined that nearly three-fourths of the cost of producing a conventional airplane can be charged to sub-assembly fabrication. This seems to be the most logical place to begin the economy drive. The answer is fewer parts. Adequate tooling and standardized design can reduce the number of component parts and, therefore, reduce sub-assembly costs.

Good production equipment should also reduce aircraft engine costs. Costs as great as $20 per hp were reported during the war. This figure is entirely out of line with costs in the automotive field, and is much too high for private planes. More efficient production will have to replace the old "hand-made" methods that have kept these costs up.

The same reasoning can be applied to engine instruments, navigation instruments and all of the other components of the modern airplane.

Some individuals in the aircraft industry have been led to believe that airplanes can be produced with cheaper tools than are used in making automobiles. Quantity for quantity, this is not true. For instance, the characteristics of aluminum—such as stretch, shrinkage, crystallization and spring-back—call for special consideration. Tools have to be specifically designed and provisions for many factors made in production equipment for this metal. These elements will bring the costs of tooling for aluminum within about the same range as for steel.

It would be utter folly to propose that the aircraft industry should adopt any such production equipment, at this particular point, as that employed by the automobile industry. It can, however, select and employ such equipment as is found to be economical for the number of planes to meet present and projected market requirements.

Competent Tool Engineers know the answers as to what production equipment is economically feasible for any predetermined number of units. They can, for instance, select a die to produce economically as few as 100 uniform parts. If production of this part should run into several thousand, a different kind of a die would be indicated. While the first cost of this die would be higher, the cost of each part produced by the die would be lower than in the first case. Likewise, dies can be made to produce hundreds of thousands and even millions of parts, with the cost per part dropping to a fraction of that for either of the first two cases.

It is sufficient, therefore, to say that Tool Engineers can tool-up economically for any given number of airplanes. They must know in advance approximately how many identical units will be produced, in order to provide the proper tools for the job.

It has been repeatedly shown that tooling for airplane production presents no titanic problems to Tool Engineers. There are certainly no mysteries to the process when designs are standardized and requirements are fixed.

The simple philosophy of Tool Engineers is, "to start a job, you must see the end."

With aircraft manufacturers practicing this maxim, reduction of costs for both private and commercial airplanes will be in direct ratio and proportion to production. Production will follow demand and the types, degree and extent of mass-production tooling will be dictated by both.

History is repeating itself. Not many years ago, automobile production men worried about the estimation of their markets and evolutions of designs on which to predicate the economics of tooling. Since the turn of the century, they have produced more than 90 million motor vehicles. It is only from this experience that they know the answers today.

Some 4000 different makes of automobiles have been offered to the American public. Today there are less than twenty . . . and they have survived because their makers adopted adequate tooling as it was made available and as demands for these products justified production innovations.

As was the case with automobile manufacturers at the close of the first World War, *NOW* is the time for more and better Tool Engineers to aid the aircraft industry.

Reprinted from October Aero Digest.

Western Metal Congress

Resumption of the Western Metal Congress, for which preliminary plans have been completed, is scheduled for the six days beginning March 22, 1947, and will be held in the San Francisco Golden Gate area. The last previous Congress was held in Los Angeles in 1941. The two Oakland Civic Auditoriums will be the scene of the coming gathering, according to W. H. Eisenman, Managing Director.

As in the past, the Congress will be sponsored by the American Society for Metals, and will have the active cooperation of West Coast chapters of the nation's leading educational societies. The technical program will include lecture courses, technical papers and round table conferences of interest to the metals, aviation, chemical and general manufacturing industries.

In view of the remarkable upsurge of industry on the west coast, and especially in California, attendance at this Congress is expected to break all previous records.

A "Tool" for the Cornfield

Riding high over the El Paso, Ill., cornfield of Lester Pfister, hybrid seed corn grower, a special tractor sprays Syndeet, an insecticide developed by the U. S. Rubber Company, to control the corn borer. The tractor will clear corn over 8 feet high and sprays 30 acres an hour.

By John E. Hyler

Milling Attachments and Accessories

Standard Commercial Appliances Widen Range and Versatility of Horizontal and Vertical Millers

2nd of Two Parts

Mr. Hyler

UNIVERSAL MILLING attachments are made by a number of firms, including milling machine manufacturers and others. These attachments usually incorporate two swiveling points, and in some instances, both of these can be swiveled through 360 degrees.

They will, consequently, do all of the work that can be performed on the compound vertical attachments that have already been cited, plus many other unusual jobs. The spindle can be set at any desired angle in both planes at once. Some of these attachments are made to take their power from the milling machine spindle, and are so fashioned at the outer end, that an arbor yoke can be used with them to provide additional stability.

Others, again, mounted on a special overarm, are driven by an individual motor. This arrangement has the advantage of leaving the regular machine spindle entirely free, and usable at any time, without first taking off the attachment. Rather heavy cuts can be taken with this type of attachment. Some firms provide strong lifting eyes, on universal milling attachments provided for their own milling machines, in order that they can readily be handled, onto and off the machine, with any convenient hoist or crane.

There are attachments of this kind, provided by "independents" who do not make milling machines, which can be adapted for use with practically any horizontal miller. Accessories of this kind are found, in many relatively small shops, for milling compound angles, cutting emergency cams, both internal and external, spotfacing on various bevels, contouring both curves and angles, sinking horizontal keyways, milling T-slots, and performing other work hard to do in any other way. These attachments will usually mill, drill, or bore at any desired angle. Some of them are particularly designed so they can be used at high rotary speeds on small-diameter tools. One company, making these adaptable for any milling machine, has designed them so that any speed up to 4,000 rpm may be obtained.

High-speed milling attachments are available in different types to solve the problem of running small-diameter tools at the necessarily higher rotary speeds they must have to cut with efficiency. These attachments are for relatively light work, and usually are not to be considered suitable for face milling operations, where a heavy side strain falls on the spindle, or on the tool. In some cases, light facing cuts may be taken with impunity. That is a matter for good judgment.

There are differences in the design of universal high-speed attachments. Some of them receive their drive directly from the machine spindle, Some are arranged with their own driving motor, and have one of their two swiveling actions around the overarm on which they are mounted.

One universal high-speed attachment that is furnished by a leading milling machine manufacturer, has a swivel range of 360 degrees, parallel to the face of the machine column, and a swivel range of 90 degrees at right angles to the machine column face. All the above-mentioned attachments are for use with horizontal milling machines.

There are cases, however, where it is desirable to use a high-speed milling attachment on a vertical miller. At least one milling machine manufacturer provides an attachment especially for this purpose. This manufacturer has also gone another step along the high-speed line, and provided a high-speed milling attachment for horizontal spindle machines, which allows a small-diameter cutter to be held in horizontal position, the same as when such a cutter is held in the

FIG. 1. Pneumatic vices, for use with milling machines, are made in a number of models with a wide variety of gripping pressures. Some, designed for light work, have a gripping force 5 times the air pressure in a given plant. Others have a gripping force of 20 to 50 times plant air line pressure. Selection is made on the basis of cutting thrust to be met, and similar factors. Photograph courtesy Production Devices, Inc., Whitehall, New York.

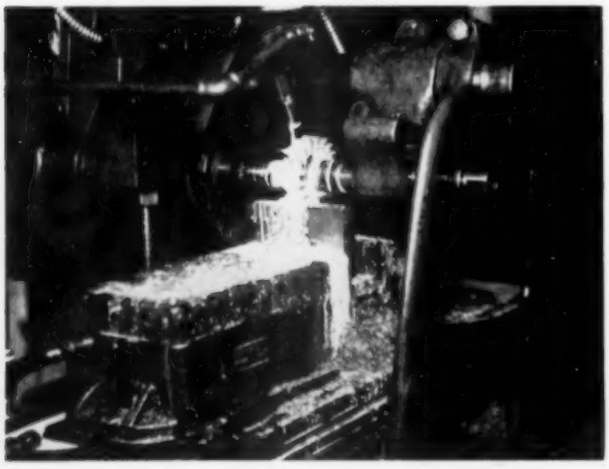
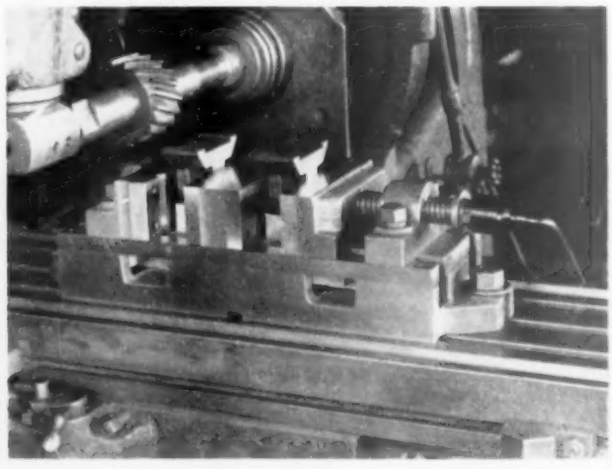


FIG. 2. Milling machine "vise-ology" includes this milling machine vise designed with an extra large adjustment of movable and stationary jaws. With an additional adjustment for the nut block, it is possible to insert an intermediate vise jaw, to provide two positions for holding two pieces of work in process of milling. Photograph from Producto Machine Co., Bridgeport, Connecticut.



regular horizontal spindle, but at a point somewhat lower. This attachment consists chiefly of a pair of gears for increasing the speed, and an auxiliary short spindle that drives the cutter.

The use of universal spiral index centers, as employed for spiral milling, is quite well known. However, there are times when it is desired to do spiral milling in shops which do not have a universal miller. It is necessary to find a way to swivel the cutter if the work is to be done with a toothed cutter on a plain miller.

At least one manufacturer provides what is called a universal spiral milling attachment, for use with his own machines, which allows this to be done. This device has additional things to recommend it. On very *short* spiral leads, it is sometimes used in connection with the universal miller, for the table of a universal miller cannot be swiveled more than 45 degrees, and if the lead is so short that the helix angle is beyond this range, this universal spiral milling attachment can be used to do the job. It also is employed in milling angular surfaces, rounding out keyways, and other work.

Multi-Spindle Heads

One possibility that has speeded certain types of milling is that of designing a special milling head with multiple spindles. One such milling head, developed during the war, simultaneously milled five staking notches in shells. Undoubtedly there are various cases arising, in which it would be a profitable proposition to design a milling head with two or more spindles.

There are also special heads and tools for use in milling machine spindles which incorporate within themselves some out-of-the-ordinary and highly convenient arrangements to facilitate milling operations. One of this type is a special facing head with an automatic feed. This head has a single-point tool which will travel radially from the center outward, or reverse, feeding automatically. Some of these heads are as small as 6" diameter, and others as large as 46".

Another tool is of precision type and brings all adjustments under micrometric control. The operator can make adjustments without stopping the tool or the machine. This tool does a wide variety of tough jobs, including back-facing, recessing, boring, facing, counterboring, and slotting.

Rack indexing or spacing devices were mentioned earlier in this discussion, but no mention has been made of rack milling attachments proper, until now. The rack milling attachment is arranged to take its drive direct from the horizontal milling spindle, and is designed so the power and motion is transmitted to a short secondary spindle, which has its axis parallel with the longitudinal table feed.

As supplied by some milling machine manufacturers, this rack-cutting attachment can also be used in connection with universal spiral index centers for cutting worms with a universal miller. It is evident, also, that such an attachment can be used for making various other milling cuts, in cases where operations can be more conveniently handled by using the machine crossfeed.

Rotary tables, when applied to the table of a milling machine for making circular milling cuts, are often referred to as rotary milling fixtures, or circular milling attachments. Their principle is quite well known. They are either hand operated or power driven, as the particular case and the amount of work at hand may seem to indicate.

They are usually graduated around their circumference so that the value of any movement of the table may be directly read. An occasional one is seen fitted with provisions for greater accuracy, including worm and worm wheel actuation, the spacing being governed through a dividing plate similar to those used on many of the better dividing heads.

Shops having no slotting machine quite often make use of the horizontal miller for this purpose by employing a slotting attachment. This device takes its power from the milling machine spindle, in most instances, and is provided by different milling machine manufacturers. Box tools for screw machines are often formed in this way, templates made, keyways splined, and other work of similar nature.

As made by one milling machine manufacturer, the slotting attachment can be set at any angle between zero and 90 degrees, either side of center, or through a full range of 180 degrees. Another milling machine manufacturer has a slotting attachment on which the tool slide can be set at any angle through 360 degrees.

We have also observed some very highly developed slotting heads for the milling machine which carry their own motor, and have speed-changing facilities through which a speed range from 50 to 250 strokes per minute is available. This particular slotting head also has the stroke of its ram

FIG. 3. **FREQUENTLY USED. This photo is not recommended as a method of holding the gear case shown in process of being face milled, but it is the sort of setup that is often seen on what might be regarded as production work. Amount of time for setting up work, and the probable degree of work rigidity while in the cut, are meant to be compared with Fig. 4, where the same workpiece is being machined while held in a simple but effective fixture. Photograph from Kempsmith Machine Co., Milwaukee, Wisconsin.**

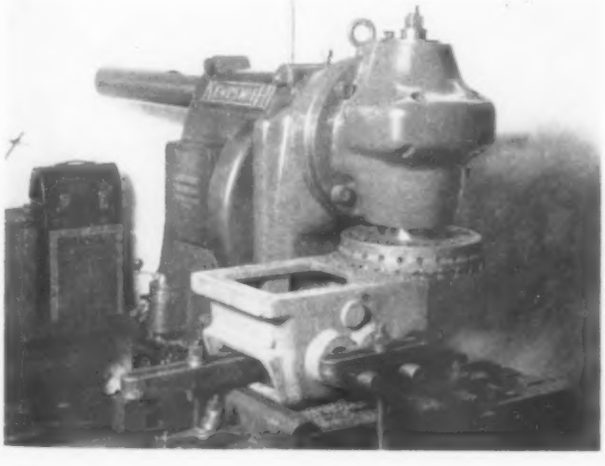


FIG. 4. **RECOMMENDED. Note the simplicity of this box-type fixture, and how well it supports the gear case being face milled. Compare with Fig. 3. Although there were only a relatively small number of castings of this type to be face milled, this fixture more than paid for itself on the first few castings. Photograph from Kempsmith Machine Co., Milwaukee, Wisconsin.**

adjustable, from zero to 4", and may be had with a mounting suited to any type of horizontal miller.

Some shops have no better way of making cams than through the use of a cam milling attachment at the horizontal milling machine. We cannot give a description of this device, for lack of space, beyond saying that the principle involved is to first make a flat former, or disc cam, which is then used as a pattern, from which other cams are cut. If peripheral cams are being cut, it is essentially a copying operation, but face cams and cylindrical cams are also derived from a flat disc-type former, using the cam-milling attachment for the purpose, and a very good job is obtained.

While it is not recommended that the milling machine be used for jig boring in cases where *extreme* accuracy is required, it is a fact that some plants, which have jigs and dies to make, perform boring and recessing operations at the horizontal miller. For this purpose, it is important to have some means of locating holes accurately in relationship to one another.

At least one leading manufacturer of milling machines has developed a micrometer table setting attachment for use in this type of work. Facilities are provided for locating holes both in the transverse and longitudinal directions, after the piece has been primarily located on the table, and the first hole bored. When using such attachments it is necessary to be sure there is no play in the machine gibs, and to locate the work so the table is kept central, as nearly as possible, with the saddle.

Micrometer Setting Attachments

On such jig and die work, it is often highly advantageous to have means for adjusting the milling machine vertically with high accuracy. Therefore, the firm supplying the micrometer table setting attachments mentioned above, also has micrometer spindle setting attachments which permit required accuracy to be obtained on the vertical dimensions of work being handled.

Consideration of methods for locating work with high accuracy, brings to mind the fact that optical locating tools for the machine shop have now been put into use. One of these, known as a center scope, gives greater accuracy on the initial setting, whether it is used on a precision jig borer, a miller, or some other machine.

This device is made by a milling machine manufacturer, and should not be overlooked in cases where jig and die work are being handled on the milling machine, especially when the initial setting is equal in importance to the relational positions of holes. The device has a shank, which is set into the machine spindle for use, and enables the exact point of the spindle axis to be seen. Tolerances are set up and held within a "tenth" by means of this device, and compensation can be made for spindle run-out when necessary.

It may not be generally known that stops of the turret type have been profitably applied to the vertical milling machine, but such is the case. Many persons have become quite accustomed to seeing stops of the turret type used on lathes. Application on the vertical milling machine is somewhat different, in that a dial indicator is used in connection. There are four stop screws in the turrets in mind, each screw being independently adjustable, so that four different depths of cut may be accurately gauged in the same handling of the work. The turret is readily indexed by hand.

There is usually little or no trouble with regard to milling tapered work of ordinary type. It is not difficult to block it up, or, in cases where there is a great amount of it, to provide a work-holding fixture that will automatically produce the desired taper.

In cases where tapered reamers and similar work that must be held between centers is being milled, index centers must be employed. Here, the proposition is more difficult, and for that reason, special facilities have been provided by milling machine manufacturers to aid in this kind of work.

One of these takes the form of an auxiliary tilting table. This table has one T-slot in its surface. It is mounted on a trunnioned fitting at one end, and on a slotted fitting at the other end, in such manner that it can be tilted longitudinally through a reasonable range. By mounting the index centers on top of this auxiliary table, and tilting it the proper amount, the work is correctly held between the centers for the cut.

One milling machine manufacturer provides a compen-

FIG. 5. Bar stock is cut off automatically into blanks with this Multi-Miller equipped with slide feed to feed bar of stock forward into vise. Both feed and vise are hydraulically operated, and timed from the table feed camshaft. Bar feeds forward into the vise jaws, the jaws close, and the cutting portion of the table cycle takes place.

At completion of cut, the hydraulic slide feed again feeds bar forward, ejecting the cutoff blanks, and feeding new length of stock into vise. In addition to cutting off, milling operations in the same plane as the cutoff can be performed in the same operation, if so desired. Photograph courtesy U. S. Tool Co., Inc., Ampere, New Jersey.

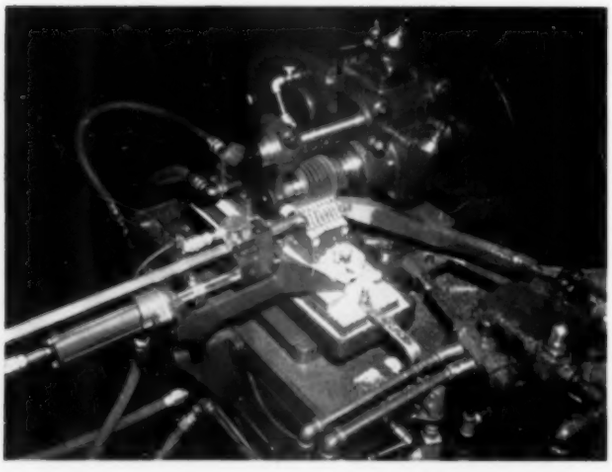
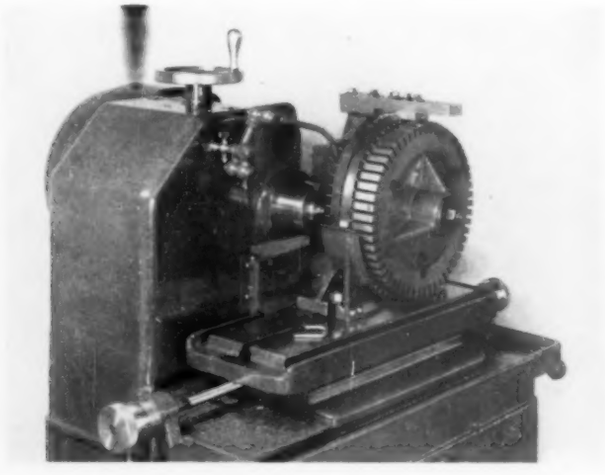


FIG. 6. Rotating fixture of "Ferris wheel" type, used on U. S. Multi-Miller for milling notches in lock shackles. Wheel of fixture receives its rotation from camshaft of machine through set of bevel gears. Operation is automatic after operator drops part into slot, where it is clamped automatically by action of the fixture, after which it is carried through the cutters, the notch milled, and the part automatically ejected. Fixtures can be obtained both in the vertical type shown, and in a horizontal type. Photograph courtesy U. S. Tool Co., Inc., Ampere, New Jersey.



sating dog and driver—so that tapered reamers and like work can be dogged on the shank end—and it is supported by a center at the tailstock end. The tailstock center is held in a bracket which is, in turn, bolted to a vertically-slotted tailstock. The bracket that holds the center is provided with an external arc at the top, and this is graduated in degrees so the center can be readily set at the same angle as the work. The driver is slotted, and the tail of the dog is provided with a close-fitting roller which fits into the slot of the driver.

As the work is indexed, this roller slides on the tail of the dog, enough to compensate for the varying differences in the distance from the center of the work to the point of driving contact. A high tailstock is provided, so the device will function properly in cases where the work has a steep taper angle and is relatively long.

Grinders and grinding attachments for use on the milling machine, as the occasion may arise, have been developed by a number of companies. There are some differences in design, but application is usually quite simple, and requires little comment here. Specific instructions, regarding individual grinders for this purpose, can always be obtained from the manufacturer.

Contouring Attachments

Another interesting aspect of milling practice is the application of contour machining equipment to vertical milling machines. A special control mechanism is employed, and is connected with both the longitudinal and cross feed screws, turning both at once, but at varying rates as the work may demand to produce a given contour. This is a highly valuable application in some plants where there is a great amount of a given type of contour work to be produced.

Special milling fixtures for holding round, hexagonal, octagonal, or square stock are also used considerably, and are so designed that they automatically hold the stock in proper alignment. Cases arise in which work must be held from a bore, and in such instances, it can be held between centers on an expanding mandrel. Such mandrels are quite readily available.

There is no end to the special work-holding fixtures that can be designed and made to fit given types of work, and to hold it in proper relationship to the milling cutters. Hydraulically-operated fixtures have been employed to solve many problems of this kind when there is sufficient work of a given type to warrant their use. Expanding mandrels can be furnished in air-powered or hydraulic type. One special milling fixture of hydraulic type was observed which serves to hold a valve disc while milling a T-slot in it for the valve stem.

Gang-chucking is performed hydraulically in different places. One hydraulic device for this purpose holds 10 pieces of work, by means of interchangeable collets, in perfect alignment for milling and other operations. Pieces to be milled are dropped into the collets. The alignment of all of them is then immediately established and held by means of a hydraulic pump. A one-quarter turn on a valve releases the work.

As might be expected, there are many manufacturers of special vises and other workholding devices for use in connection with the milling machine. It might be wished that various other pieces of holding equipment could be considered here.

It is believed that what has been said, together with what is shown in the accompanying illustrations, and with what experience the reader has already had with different milling machine vises and fixtures, this article has been sufficient to give a fair survey picture of the important field of milling attachments, fixtures and adapters.

Resistance Welding Cuts Costs

CHANGEOVER TO resistance welding, at the Hollister-Whitney Company, Quincy, Ill., has resulted in a marked increase in output, with commensurate reduction in cost, of the company's "Lubester" oil dispensing tanks for oil fueling stations. 38 minutes have been cut from the previous time of 2½ hours, using arc-tacking methods.

The machine used—shown in Fig. 1—is a 75 KVA Progressive Pedestal welder operating on 220 v. 60 cycle supply. Throat depth is 48, and the machine is provided with rectangular lower arm to accommodate the shape of the tanks. The upper arm is braced from the machine column, thereby all but eliminating deflection, during welding, that might result from the long overhang. Controls are G-E, with Ignitron tube contactor.

Fig. 1 shows the operator welding the top of the body of the tank, while Fig. 2 shows the inside of the top, with the stiffeners welded inside the tank. Material used is 16 ga. hot rolled steel, not cleaned prior to welding.

Fig. 1

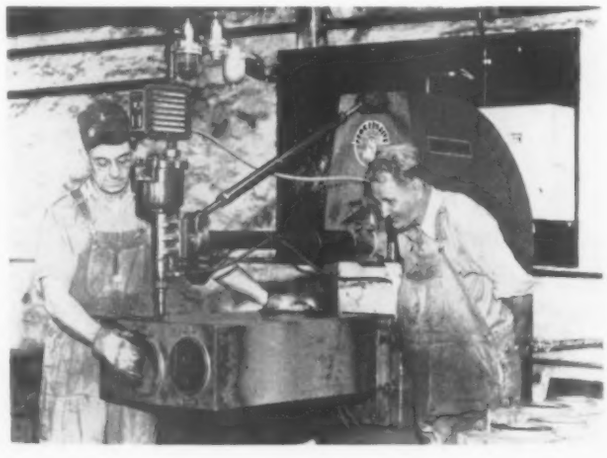


Fig. 2

By Fred W. Steiner

Reviews and Previews

FOUNDRY EXECUTIVES, meeting at the Netherland-Plaza Hotel, Cincinnati, October 22-23, for the 18th Annual Convention of the Gray Iron Founders' Society, Inc., generally expressed themselves as confident that the business of making gray iron castings should continue good for one or two more years.

However, there are two important factors which they thought might tend to dampen such optimism. First, there is the shortage of raw materials, and secondly there exists a scarcity of good workers who care to work in many of the foundries of the country.

There are some 5,000 foundries of all kinds in the United States, of which 2,879 are gray iron, and since the gray iron foundry business is basic to so many others, it is easy to understand its importance, and why the Cincinnati meeting was thus recognized as an indication of the future trend of industry in general.

Executive Vice-President of the Society, Wm. W. Coutts, arranged an interesting program, including speakers on subjects especially newsworthy for those who make castings; but, there was much that was of interest to Tool Engineers, especially to the several A.S.T.E. members who were in attendance.

The first guest speaker was Dr. Joseph S. Kopas, Director of Department of Personnel Development, Fenn College, Cleveland, whose address, "Developing Management Skills in Supervisors," showed the important responsibility of top management in developing techniques and skills in its shop foremen and supervisors, so that these secondary bosses, so to speak, can transmit the wishes and desires of management, in an efficient manner, to all men in the plant.

As one of the important speakers, the Society's retiring president, H. L. Edinger, President of Barnett Foundry & Machine Co., Irvington, N. J., expressed confidence in the immediate future of the foundry business.

Howard A. Stockwell, Treasurer, Barbour Stockwell Co., Cambridge, Mass., and the newly elected President of the Society, pointed out that since pig iron is still under governmental control, there remains much to be done through the Society's Advisory Committee to the Office of Civilian Production Administration and Industrial War College.

Of considerable interest, to the members attending, was a proposal — as reported by John M. Price, President, The Ferro Machine Foundry Co., Cleveland—to spend $60,000 for a three-year program to assist major colleges in the setting up of technical courses for the training of foundry engineers and managers.

Frank O'Malley, Ferro Personnel Director, told how his company holds employees—once it gets them. Because foundry work had not proven attractive in previous years, help wanted "ads" now point to definite advantages in pay, pleasant working conditions, adequate safeguarding of health as well as recreational and parking facilities. These things, together with medical checkup and "weeding out" possible undesirables before hiring, and pains to fit the worker to the job, have all been instrumental in making good workers stay on the job.

Lester D. Knight, Chicago, speaking on "Foundry Modernization," pointed out first of all that modernization means not only new and better machines and mechanical installations, but it also means improvement and modernization of sales promotion methods, as well as other procedures.

Ideas to make foundries better places in which to work, as suggested by Mr. Knight, included better plant layouts with straight line flow, improved machinery, reduction of rehandling and more emphasis on the physical comfort of machine operators and other workers. Through the use of "before-and-after" picture slides, the speaker built up an effective case for modernization as a means of increasing production and cutting costs.

Dr. Frank August, Manager, Veterans' Administration, Cincinnati, stressed advantages of hiring veterans, even though they are partially handicapped by injuries received while in service. This is not only a humanitarian policy, but the speaker showed how it would enable management to obtain high quality workers and yet pay them adequately.

Dr. August explained that although wage ceilings have been placed on the widely publicized GI Bill of Rights' benefits at $175 per month for single, and $200 per month for married men, there are no ceilings on handicapped veterans eligible for aid under the less-known Rehabilitation Act, Public Law No. 16. The only requirement is that they be paid what a journeyman is worth.

Foreseeing the eventual return of highly competitive times, Mr. A. A. Hageboeck, President, Frank Foundries, Corp'n, Moline, Illinois, revealed in his report that the Gray Iron Founders' Society has already set up 12 cost study groups in 14 states—in New England, and other eastern and north-central states—whereby 195 foundries are represented, so that each member-foundry may have some check on its cost figures, and can also compare its costs with others in its own geographical area.

Accurate figuring of costs, and more effective merchandising also came in for considerable discussion. Chairman of the panel session on merchandising was Mr. E. C. Hoenicke, General Manager, Foundry Div'n, Eaton Manufacturing Co., Detroit. The emphasis at this meeting was on selling, not just so many castings, but providing for adequate engineering service as well.

Of the many speeches and reports at this two-day meeting, perhaps the most interesting — as judged by the great amount of pro and con discussion evoked —was the address of Wayne L. Morse, U. S. Senator from Oregon, speaking on "Labor, Management and Government." He implied that too much governmental interference with industry, now that the

war is over, is unwise. Especially so, in view of the probability that federal legislation may soon outlaw harmful practices that have so frequently disrupted our economy.

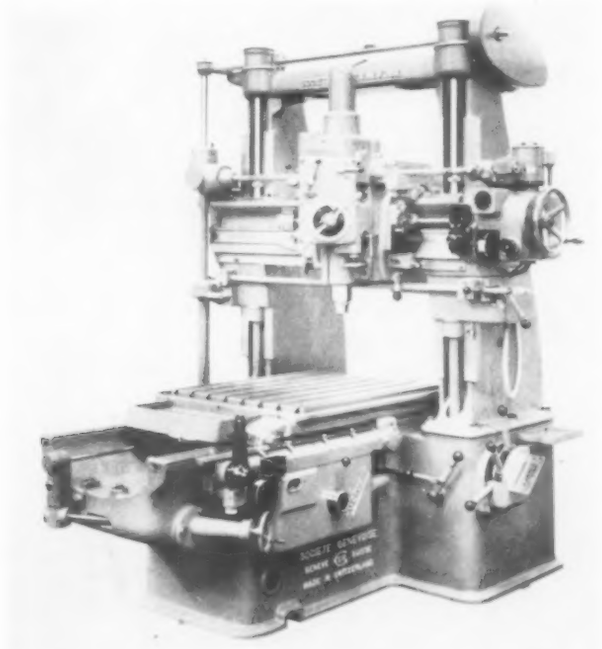
It is also difficult for real progress to evolve from results of fact-finding committees, Senator Morse asserted, because so many of these groups seek to find only those facts they want to find, hence, their conclusions are likely to be prejudiced. Senator Morse felt that industrial difficulties can best be solved through due processes of the law. It cannot be accomplished when leaders in government follow a policy of political expediency; in other words, he was suggesting that we look more attentively to the courts for the truth . . . and the truth shall go far . . . towards keeping America both prosperous and free.

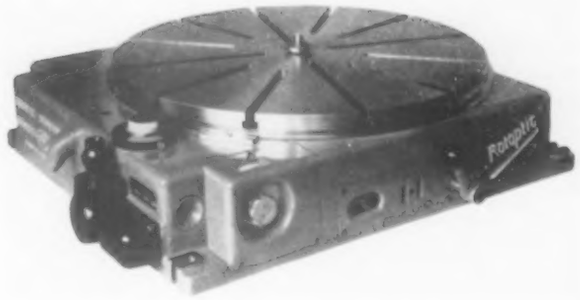
AT A PRIVATE SHOWING held at Convention Hall, Detroit, the Motch & Merryweather Company—exclusive representatives of the Cosa Corporation high precision machines and measuring equipment of Swiss manufacture—sponsored an exhibit, under power, of the No. 3-K Sip Jig Borer, the Studer PSM Profile Grinder, the Bechler Precision Automatic Screw Machine and the new Hydroptic "B" Sip Jig Borer and Milling Machine.

The latter departs considerably from previous Sip jig borer design, which was confined to boring operations and which were therefore somewhat limited in application. For example, a part may be precision bored on a jig borer, but when transferred to another machine—say for milling—the accuracy of subsequent operations may not compare favorably with the accuracy of the bores.

The new machine, therefore, has been designed for milling as well as boring operations, thereby insuring a permanency of accuracy, in spite of heavy mechanical stresses and strains, together with high efficiency over a large range of speeds and feeds and easy operation as a result of automatic movements and convenient location of controls.

The machine incorporates an optical measuring system consisting of a standard scale, of extreme precision, sighted by a micrometer microscope with a large magnification. This represents an ideal method for setting, since it is not affected by mechanical stresses and, consequently, assures permanent accuracy to readings to 0.00005" or 0.001 mm.





An auxiliary, especially designed for use with the "B" jig borer and miller is the "Rotoptic" High Precision Circular Dividing Table. This table differs from conventional dividing tables in that the worm is used only for rotating the platen, whereas angular measurements are made optically. Therefore, the accuracy of the table is not impaired by wear. The outer edge of the platen is graduated in sixths of a degree—or 10 minutes—for initial positioning with the naked eye. Precision measurements are then effected by a microscope, much after the manner of the optical setting of the jig borer. Vernier reading, under the microscope, is accurate within one second of the arc.

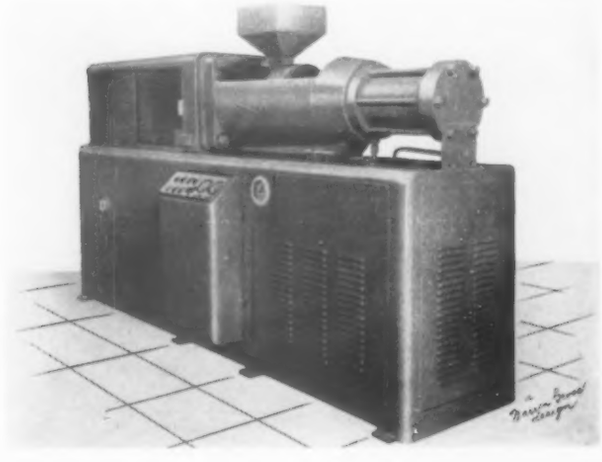
AT AN INFORMAL RECEPTION held at the plant of Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich., early in November, the company's new 2-ounce Plastics Injection Molding Machine was unveiled by Harry L. Wise, President, before an invited group representing plastics industry executives and the press.

The new Hy-Mac machine—designed by Warren Gross, eminent plastics engineer—represents Hydraulic Machinery's first production, under its own name, in the plastics field. In describing this machine, President Wise pointed out that this is "not just another press," but one incorporating an entirely new conception of controllability, ease of operation and production efficiency—throughout, a design "completely unfettered by conventional practices of the past."

For example, heat in the chamber and nozzle can be regulated, indefinitely, by means of two electronic controls, without danger of burning the material. A new type of electronic control, so mounted on the machine panel that it is not affected by machine vibration, guarantees a temperature range within plus or minus two degrees.

An equal insight and understanding of plastics molding problems seem to prevail in the handling of mold clamping,

The Hy-Mac Injection Molding Machine, by Hydraulic Machinery, Inc.



platens, metering of material and timing, as well as in provision for safety precautions. The main objective, in this design, has been to produce a machine which can be operated successfully by people with limited if any previous experience in the plastics field.

Although rated at 2-ounce capacity, the machine is actually designed for 50 per cent overload capacity and is therefore capable of handling a wide range of small plastics parts. It may therefore be applied to the production of automotive body appointments, toys, novelties, notions, costume accessories and jewelry among other things.

IN THE MATERIALS HANDLING FIELD, Clark Tructractor, Battle Creek, Mich., has come out with the Trucloader, a telescopic fork lift truck having a maximum lift of 84 inches and capacity of 1000 pounds. While a lightweight fork truck, relatively speaking, it is primarily designed for operation in narrow spaces, a convenience, to use that term, considerably enhanced by the short outside turning radius —only 57 inches.

It can be operated, with ease, in or out of highway trucks and trailers, or in narrow elevators, and is especially advantageous for moving dies and tools, and stacking them, in the narrow aisles usually found in tool cribs. The Trucloader, illustrated below and built to Clark standards of quality, is gas powered and equipped with solid rubber industrial type tires; however, pneumatic tires can be supplied.

INTRODUCED AT PRIVATE showings, the Dual Drive Lathe, by the R. K. LeBlond Machine Tool Company, Cincinnati, is an entirely new ultra modern development designed to bridge the gap between the company's Regal, and heavy duty line of toolroom and production lathes. As the name implies, the Dual Drive incorporates two separate driving arrangements—direct belt and gear drive, and is powered by a 3 hp main drive motor. Swing is 15", with distance between centers starting at 30 inches.

Of twelve spindle speeds available, eight are low speed through gear drive, and speeds in this range are 28, 41, 60, 95, 134, 193, 282 and 445 rpm. The four high speeds—540, 782, 1140 and 1800 rpm—are for use with carbide tools and are entirely cut off from the gear drive.

Both drives are said to deliver full power in proportion to the speeds and feeds employed, and the 12 spindle speeds are controlled by a single lever which performs the function of the two levers normally required. The lever is fitted with a subdivided plate containing the spindle speeds, and an arrow for quickly guiding the lever to the desired speed.

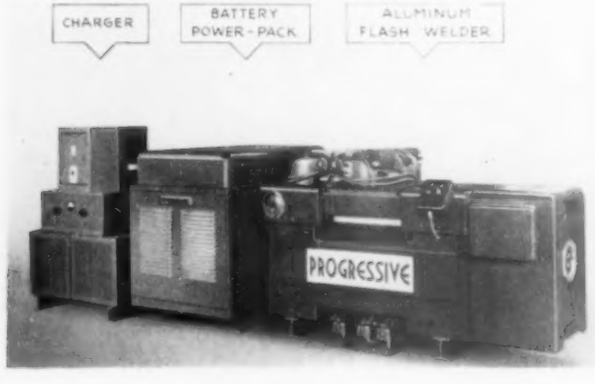
The Trucloader, by Clark Tructractor, Battle Creek, Michigan.

The LeBlond Dual Drive Lathe, with detail of headstock showing single lever speed control and rapid speed selector.

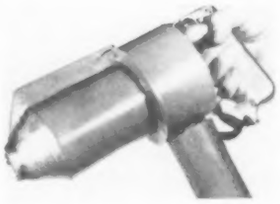
Typical of LeBlond engineering and workmanship, the machine is cleanly designed, ruggedly built, and incorporates all of the qualities of a pacemaker in the modern production scheme.

PREVIEWED AT THE company's plant, Detroit, and exhibited at the Metals Show, Atlantic City, a new development by Progressive Welder Company—the "Progress-O-Matic" —is said to be even faster in operation than the Ultra-Speed machines built by Progressive. In general, the machine embodies high air pressure operated and controlled automatic multiple spot welders.

The "Progress-O-Matic," an automatic multi-spot resistance welding machine, by Progressive Welder Company, Detroit.



Above, the Toccotron electronic type heating unit. At right, the Tocco Heat Gun.



In addition to high speed of operation, an outstanding advantage is that the various welding guns—of which there is a possible maximum of sixty — can weld different thicknesses of metal, requiring variable welding times, heats and speeds. This is accomplished by an ingenious arrangement of cams and a rotating disc, provided with valve ports and exquisitely timed switches, to select the heat required for each weld, together with two breakers, synchronized with an indexing disc. The breakers serve to initiate and stop firing of the tube contactor.

The rotating disc is actuated by a Geneva drive, and as this "indexing" disc turns, it uncovers the first port and admits air, under high pressure, to the corresponding gun circuit—say No. 1. Coincidentally, the heat control cams on the drum select the proper heat controls for the gun, while the speed control cams adjust the speed of the air motor in accordance with the desired weld cycle. The two breakers then close, initiating the welding current and, at the proper moment, one of the breakers opens, interrupting the current. The cycle repeats, gun for gun, until as many as are required for a particular job have functioned.

The operation sequences follow in extremely rapid order, yet, permit a wide variation of both "long" and "short" welds without penalizing the complete machine cycle to accommodate the longest weld. Thus, production is remarkably high—said to be 50 per cent faster, floor to floor time, than is possible with the Ultra Speed welder or similar types of automatic spot welders.

FOUR IMPORTANT new developments—the "Tocco" Heat Gun, a 30,000 cycle motor generator type Induction Heating Unit, a new variable ratio Transformer, and a 7½ kw output, 3 megacycle Toccotron Induction Heating unit —are recent contributions, by the Tocco Div'n of the Ohio Crankshaft Company, Cleveland, to the field of induction heating.

The Tocco Heat Gun is a portable inductor that permits bringing the heat to the work instead of the work to the heat, as in conventional induction heating. Hence, it is particularly adaptable to cumbersome assemblies where many spot heats are required, or for short production runs where it would be uneconomical to provide a special inductor coil for each part to be treated. It has been used with leads up to 20 feet, and longer leads would be practical.

The "gun," which is built for operation with the standard 10,000 cycle motor generator type induction heating unit, is controlled by a simple trigger switch and utilizes a multiple turn coil to obtain the necessary high flux density in the area being treated, with relatively low current supply. This permits the use of long leads of moderate dimensions to transmit power with high efficiency.

The 30,000 cycle Tocco machine triples the previous high frequency limit of motor generator type induction heating equipment, which has been generally satisfactory for surface hardening parts over ⅜" in diameter, and enlarges the ranges of this type of equipment to include effective surface hardening of even smaller parts.

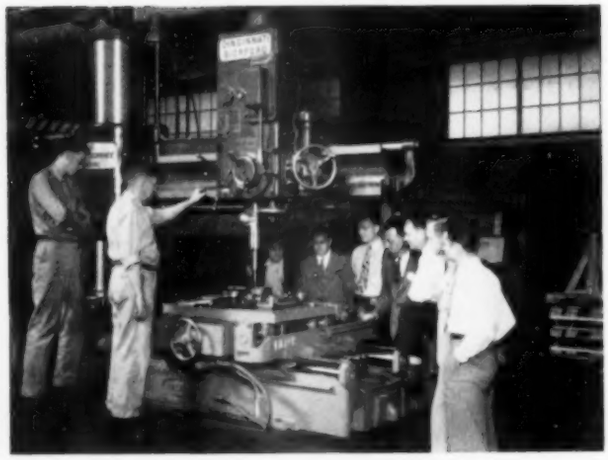
The new variable ratio transformer can be made to match any size load and any size inductor coil by merely changing leads; hence, changeover time is negligible and one transformer is suitable for all jobs. The new Toccotron is an electronic type induction heating unit designed to increase efficiency on heating parts of very small diameter or very thin strip stock.

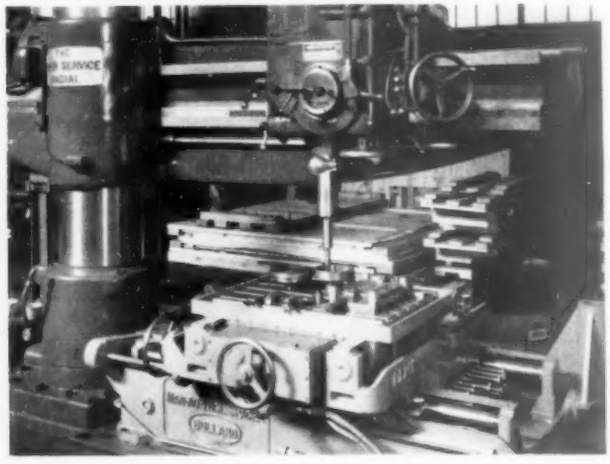
At left, the 30,000 cycle motor generator type induction heating unit. At left, below, the Tocco variable ratio transformers, and right, below, the Tocco heat gun shown "brought to the job."

By Gunnar Skog

Application of Man-Au-Trol Spacer

A Pictorial Sequel to "Man-Au-Trol Spacer Insures Accurate Duplication," September, The Tool Engineer

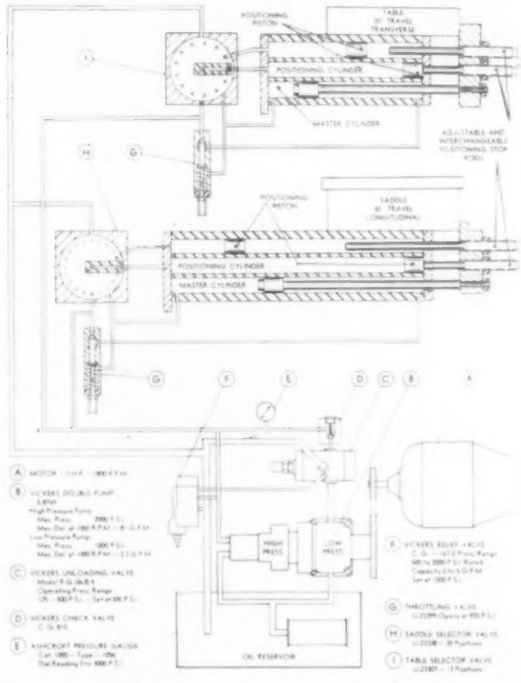




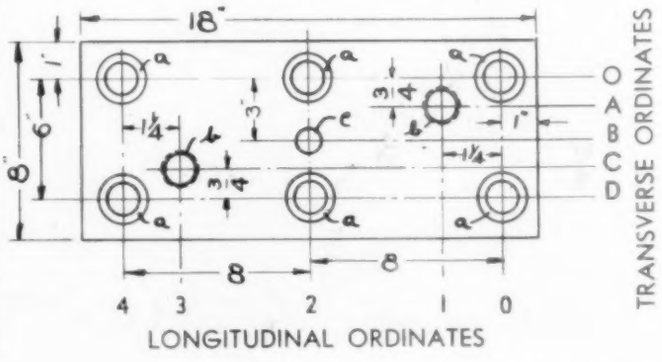
As one of the new devices designed to facilitate production of drilled parts, without use of jigs, the Man-Au-Trol Spacer, by the Bullard Company, Bridgeport, Conn., has aroused considerable interest since its introduction to industry. Shown above is a demonstration of the device, under sponsorship of the Motch & Merryweather Machinery Company, at the plant of the Cincinnati-Bickford Tool Company, Cincinnati, Ohio. A Cincinnati-Bickford Super Service radial drill was used for the demonstration. A close-up of the Spacer is shown at right, above.

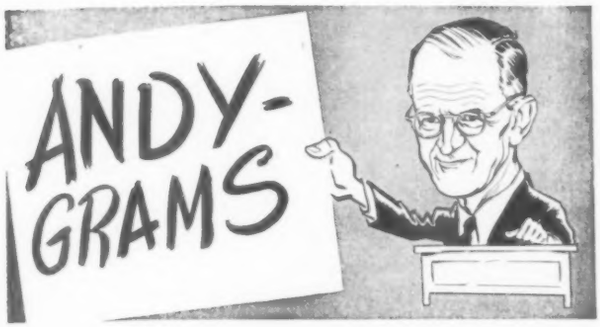
Functions and operating controls are shown in the hydraulic circuit diagram at the right. Note that longitudinal and transverse positioning, of the work table, is effected by means of hydraulic cylinders, with adjustable and interchangeable stop rods serving to accurately duplicate hole locations. Once the stops are set, locations may be duplicated *ad infinitum*.

Set-up is facilitated by means of combined operation sheets and engineering drawings, as suggested below. Like holes should be grouped under one identification mark—see "a, b, c"—with the center line or ordinate, passing through each hole, consecutively numbered and lettered, longitudinally and transversely. These ordinates represent dial settings—numbered for longitudinal travel, lettered for transverse—which may be recorded and filed for future reference. The record sheet will show lengths of all stops and the incidental dial settings and will therefore serve as a set-up chart for future runs of the same job. It's as simple as all that.



HOLE	TYPE AND SIZE OF HOLE	DEPTH	NO. OF HOLES
a	21/32 DRILL	THRU	6
	29/32 C-BORE	5/8	6
b	27/64 TAP DRILL	1	2
	1/2 N.C. TAP	7/8	2
c	23/64 DRILL	THRU	1
	.375 REAM	THRU	1





I'VE SO MANY THINGS to cover, because of all the happenings during the past month, that I'm going to wind up the year with a two-page column. At that, I'll only be able to hit the high spots. For one thing, there was the Semi-Annual Membership and Directors' meeting, originally scheduled for Pittsburgh but held later in Detroit a/c the hired help in Pittsburgh were busily (?) engaged with the current national pastime.

Fortunately for my space allotment, I don't have to say very much about the Semi-Annual, Doris Pratt having covered that with her usual thoroughness, pics and all. (The good looking guy in the middle—where I usually find myself—is me.) Anyway, time goes so fast, between these conventions, that six months seem like a day; consequently, it's getting so that the convenees greet each other with "good morning" when they meet.

Once, when the Society was smaller, there would be time for relaxation between business sessions. But, with the growth of the past few years, the boys have been so busy, what with committee work and all, that there's been neither time nor opportunity for jollity. The meetings are devoted to serious business that, oftener than not, drags into the small hours. The A.S.T.E. is big business, exerting a very considerable influence on industry, both national and international.

Of the new streamlined Directorate, all members of the Board are old timers with the exception of Grant Wilcox, and even he is a seasoned veteran as a result of Chapter and Nat'l committee work. Anyway, he was the object of very favorable comment both by his associates and the gallery. The guy's a comer!—handles himself like a master diplomat.

As you probably know by now, Tom Orchard resigned his vice-presidency a/c other pressing interests, as a result of which Irwin Holland and Bob Douglas were stepped up a notch apiece. Two fine men! From all indications, Hartford is slated to contribute a third prex to the A.S.T.E. in a couple of years, with Canada trailing by a year.

Brad Peirce, of course, has made such a fine record, during his several years on the Directorate and the Exec. Com'tee, that his succession to the chair, come next spring, may be taken for granted. At that, Al Sargent has set a pace, in getting things done, that will keep his successors stepping. We've a good Society, headed by good men.

Early in November, I trekked to Schenectady for a long deferred visit to General Electric Company. My visit was primarily with Clayton P. Fisher Jr.'s Press Relations Div'n, where I was taken under the wing of Harold Mallia and shown the town from the top of the hill to the far flung reaches of the vast G-E plant.

Had a pleasant visit with Ed. Ernst, Ch'man of the A.S.T.E. Handbook Com'tee, who showed me samples of metal drawing that had considerable history behind 'em. Then, with Harold Mallia to a private showing of General Electric's movies on *More Power to America* and *Resistance Welding*. Maybe I'm off a bit on the titles—for once (?) I can't read my notes—but anyway, there wasn't a dull moment during the entire run and the sooner you boys North, East, West, South put these sound movies on your meeting programs the sooner you'll know more about welding techniques and what American industry is doing to put the world on the high road to prosperity. (Nat'l Program Com'tee take note.)

Caught the afternoon train with about two minutes to spare, and that evening—Nov. 6—found myself in Poughkeepsie for the chartering of Mid-Hudson Chapter, A.S.T.E. And was that something! One hundred fifty-one charter members before the meeting closed—the biggest charter list in A.S.T.E. history! Ray Morris was there, as speaker of the evening, with Irwin Holland, conferring the Charter and generally acting as MC, and Harry Conrad, who told the local boys about Society operations. Got in a couple of words myself, but nothing particularly important.

When I got into the meeting room, one of the boys—Joe Petz—took a look at my phiz and stuck out a glad hand. "Say, I'll bet you're Andygrams! Y'know, I read your *line* and by golly I like it!" His comment was dittoed by several other locals, so right away I knew I was among friends. As for that, the Poughkeepsie boys are typical ASTEers, exuding good fellowship and friendliness. They'll fit into this A.S.T.E. scheme like an old glove.

John Petz—brother of Joe and ch'f eng'r at Internat'l Business Machine—had been elected Ch'man at a previous organization meeting, and impressed me as being an exceptionally capable executive. But then, the entire slate of officers was drawn from live wires in the several Poughkeepsie industries. We're going to hear from that outfit! One thing they did was to make a sound recording of comments by the Charter members; no argument as to who was who at the grand opening.

The meeting over, Irwin Holland drove Ray, Harry and myself to Hartford, some eighty miles away. A beautiful evening, starry and moonlit, with the road winding through hill and dale. Neat mill villages; a mile long tunnel of interlaced cottonwood trees pierced by the headlights. Then Hartford. Both Ray and Irwin had offered to sleep us at their homes, but the local Chapter had reserved—and paid for—rooms at the Bond, and there we were dropped off, all serene with the prospect of a good sleep.

But, the hotel had sold us out, and there we were, two homeless waifs in the wee-wee hours. Finally, we got bedded down at the—well, never mind where. The beds were good, and palace or hovel, a good bed feels the same after the lights go out. Me, I woke up at 6, blithe and cheerful as ever, and phoned down for coffee and sinkers, which a kindly janitor rustled from a nearby one-arm. Had to drink both cups myself a/c Harry, the ol' sleepyhead, wanted more shuteye. Cramped my style, the guy did; couldn't sing in the bathtub.

A stroll around Hartford, to find that they'd bottled up the river that, in days of yore, wound through Bushnell Park. Hartford's a nice town—one of the best—needing only a good hotel. Come noon, lunch with Irwin Holland, who then took us to Pratt & Whitney's where, after a plant tour, I settled down in Irwin's office where, for a couple of hours, I unobtrusively watched our 2nd V.P. go through his stuff.

And he knows his stuff, make no mistake about that. There's this difference between theory and the know-how acquired through years of experience, that the man with the know-how can decide, in a moment—and usually "on the nose"—issues that would leave the theorist grop-

ing for the answer. In this connection, an engineering diploma is like a marriage certificate; it's not the paper that makes the marriage, or the ceremony, but the long years of living together. And it takes long years of living with tools to make a tool engineer.

Had a pleasant visit with Ed Shultz, P & W Sales Mg'r and author of *Men Who Make Dreams Come True*, now happily on the mend after his recent illness, and with Chas. M. Pond, P & W vice prex and mg'r of the Small Tools Div'n. Then to d'Arc's (A. H. d'Arcambal, P & W vice prex and ch'f metallurgist) charming home in West Hartford for cocktails. Time went so fast we just got to the meeting—the occasion being Hartford Chapter's tenth anniversary—in time. Didn't even have time to shave or to change into the white shirt I've been saving these many moons for a special occasion.

Seems that about every other A.S.T.E. celebrity was there, including past prexies Frank Curtis and Jim Weaver; Al Warman, John Lindegren and Vic Ericson from Worcester; Chauncey Newton—come all the way from Rochester—and oodles of others too numerous to mention. Guests of honor were the past Chapter Ch'men—A. H. d'Arcambal, Ray Morris, Irwin Holland, Henry Hauck, Carl Moeller, George Highberg, Henry Moore (who, his silent partner consenting, postponed a wedding anniversary to attend the meeting) and Henry Rockwell. Hank, incidentally, has been adopted by the Swedes and can now say Smorgasbord like a native.

Ed Morency, incumbent Ch'man, conducted the meeting with ease and dispatch and everything went along swell until my turn came to speak. Did I mention that I was coffee speaker? Anyway, what with Ray Morris heckling me (he had reenforcements!) I was so flustered that, back on the job, I haven't been able to sleep all day since. But, you can't hold a good man down, and I muddled through regardless.

That over, we wended our way to the local Gas Company, where there were more speeches, winding up with an excellent talk on cutting steels by A. H. d'Arcambal. In connection with that, I overheard one young fellow say to another: "Gosh, it just doesn't seem possible that anybody could know as much as that guy does." Well, d'Arc's been around.

During the evening, found time for a get-together with John Sundkvist and his big brother Eric, respectively prex and v.p. of The American Tool W'ks, and Bill Jarvis, of Chas. L. Jarvis Co., who *steaked* me to a big feed during the Philadelphia meeting. A nightcap with Frank Curtis, whom I agreed to meet the following A.M. in Springfield. But, I couldn't get a reservation out of that town, so went back to Detroit via New York. Had intended to include Providence in my tour but had to defer that due to pressure of work.

Coming home on the Empire State, had an experience that's too good to keep to myself. I was sitting in the club car, somewhere along the Hudson, when I felt a nudge in my ribs. Then: "Say, podner, can you stake me to the fare to Albany?" Turning, I beheld a character that, at first glance, reminded me of the Ward & Vokes vaudeville team of a bygone year. He *was* a bum!—so covered with coal dust that he could have stoked a locomotive. I said: "No, I won't. You're on the train, and the worst they can do is kick you off. And I'm curious to see how they do it. But, I'll buy you a drink, and maybe if you sit tight they may pass you by." And they did!

About that time, I teamed up with three convivial spirits —John E. Smith, Geo. W. Black and W. Q. Quincy (wonder why two Q's?) of Detroit—and when I got back to the club car my pal from the Winegar Woiks was gone, presumably having gotten off at Albany. But next morning, I saw him in the diner, nonchalantly having breakfast with a woman who, the night before, had been sipping a drink by her lonesome in the club car. Wotta man!

Well, so much for my travelogue. As post impressions from my visits to General Electric and Pratt & Whitney I am more than ever convinced that, in a finer sense, there really is no such thing as a big corporation. For big or small, any manufacturing company is just a get-together of people to do a job of work, and sooner or later the guy that carries the ball will reach a goal. And if a guy gets thrown for a loss, there's always another game.

During my trip, too, I had a chance to become more closely acquainted with Harry Conrad, our Exec. Sec'y. When I first met him, last year, I said in the Column that "He'll do.", and I am very sure that, by now, my early impression has been quite confirmed by the rank and file of the Society. He is an able executive and, in addition, the kind of a guy you'd like to have with you on a fishing trip. He wears well.

Back on the job to find a pile of mail including requests for know-how in various lines and from points in the States, Canada, Latin America and Europe. In this connection, some of the sketches with which I illustrate verbal descriptions are "sketchy," to say the least, but from responses they seem to convey the idea and besides that's about all I have time for. Several manufacturers are looking for agents, and if any of you boys North, East, West, South can take on additional lines let me know.

In this connection, I wish that some of you boys with highly specialized tools—and the not so special, for that matter—would stick an ad in the Directory, which has all the possibilities of becoming a forum for display of tools. For instance, several calls came in for burnishing tools, such as are used for hole finishing, and it took time to track 'em down. Usually, I can pull these various gadgets from my mental file, but there are times—too many, as a matter of fact—when we have to spend precious hours hunting 'em up. So, quit hiding your lights under a bushel and open up! The world wants to know what you're doing, and the Directory is an excellent display medium. So's *The Tool Engineer*, as everybody knows by now.

Thursday, Nov. 14, I gave my talk on Welding Fixtures —of which the first installment appears in this issue—at the meeting of Detroit Chapter, and with about 300,000 Nimrods—including beau coup tool engineer—having gone chasing deer in the north woods, I had looked forward to an empty house. But, the attendance was encouraging and the boys were either quite interested or downright polite; anyway, what with my associate Fred Steiner, and my secretary Mrs. Gomes manipulating the *animated drawings* and other gadgets, there weren't nary a listener fell asleep. And so ended a hectic month, with the book to put to bed as a final chore.

Well now, here we are at the end of the year, with the holidays right around the corner. So, in behalf of *The Tool Engineer* staff, I wish all of our friends throughout this far flung A.S.T.E., and their friends, a very Merry Christmas and a Happy New Year. May we now, with a world apparently striving for Peace on Earth and Good Will to Men, look forward to the progress and prosperity, and the good will between nations, that only Peace can bring.

ASTEely yours,

Andy

A.S.T.E. NEWS

NEWS OF INTEREST AND ABOUT MEMBERS

National Committee Chairmen, and others attending October 26 meeting of the Board of Directors in Detroit, listen to Board discussion of a Society project. At first row of tables (left to right): H. D. Hall, Program Chm.; J. A. Siegel, Judicial Chm.; F. W. Curtis and E. W. Ernst, Handbook Co-Chm.; and O. W. Winter, Education Chm. Second row: E. W. Dickett, Membership Chm.; W. H. Smila, Standards Chm.; H. D. Mozeen, Membership Com.; R. H. Morris, Con. and By-Laws, Chm.; F. W. Eaton, Finance Chm.

ASTE National Officers and Directors hear report of a committee chairman. Clockwise around the table are: A. M. Sargent (in front of flag), Pres.; T. P. Orchard, R. B. Douglas, Third Vice-Pres.; A. M. Schmit, H. E. Collins, G. S. Wilcox, Jr., H. E. Conrad, Exec. Secy.; W. A. Dawson, Asst. Secy-Treas.; V. H. Ericson, Treas.; C. B. Cole, I. F. Holland, Second Vice-Pres.; and W. B. Peirce, First Vice-Pres.

Holland and Douglas Advanced, Johnson Elected Secretary

Board Gives Boston '47 Semi-Annual, Sets March 19-22 for Houston Meeting

ELECTION OF a National Officer to fill the vacancy created through a resignation and two promotions, and balloting for an Annual Nominating Committee, were among major actions taken by the ASTE Board of Directors during its Semi-Annual Meeting, October 26, at the Fort Shelby Hotel, Detroit. Presiding officer was A. M. Sargent, Society President and Chairman of the Board.

Other important decisions made by the new 11-man Board included the selection of Boston as the 1947 Semi-Annual Meeting city and the adoption of budget and project appropriations totalling approximately a quarter-million dollars.

The Board regretfully accepted the resignation of Thomas P. Orchard, Second Vice-President, tendered through pressure of personal business; advanced Third Vice-President I. F. Holland to the post vacated; named National Secretary R. B. Douglas to the Third Vice-Presidency, and elected George C. Johnson, Chief Engineer, W. F. & John Barnes Co., Rockford, Ill., as National Secretary. Mr. Johnson is a former Chairman of Rockford Area Chapter, and has served on the National Membership Committee.

Names Nominating Committee

Nominating Committee personnel includes two incumbents—Ray H. Morris (Hartford) and L. G. Singer (Toronto)—A. M. Schmit (Toledo), H. R. Wentzell (South Bend), and W. W. Young (Boston). The new committee is securing nominees for 1947-48 Directors, to be submitted to the membership at January Chapter meetings.

From the slate of directoral candidates, individual Chapters will make recommendations to their respective Delegates for voting in the March election of Directors.

Acceptance of the Bay State capital's invitation for the '47 fall meeting followed an investigation of the community's facilities and its accessibility to large numbers of the Society's members.

In considering the proposed budget submitted by Finance Chairman F. W. Eaton, the Board was guided by programs outlined in reports of Committee Chairmen and others earlier in the meeting. The figures arrived at by Mr. Eaton and Budget Director H. E. Conrad, from original estimates prepared by the various departments of the organization, were further revised in some instances.

All officials seeking appropriations were carefully examined, and cooperated in the final drafting of a balanced budget.

Among the most pretentious programs are those projected by the National Edu-

In This Issue

Chapter	Page
Baltimore	71
Boston	70, 73
Buffalo-Niagara Frontier	66
Chicago	71
Cleveland	61, 70
Columbus	69
Dayton	70
Detroit	62, 71, 72, 73
Elmira	67
Erie	67
Evansville	73
Flint	72
Fort Wayne	64
Hartford	60
Los Angeles	71
Milwaukee	73
(Minneapolis) Twin Cities	70
New Haven	73
New Orleans	65
Peoria	73
Philadelphia	69
(Poughkeepsie) Mid-Hudson	62
(Providence) Little Rhody	71
Rochester	69
(San Francisco) Golden Gate	66
Springfield (Mass.)	67
(Springfield, Vt.) Twin States	63
(St. Catharines) Niagara District	66, 70
(St. Charles, Ill.) Fox River Valley	62
St. Louis	61
Syracuse	71
Toledo	67
Toronto	67
ASTE Productioneers	68
Builders of ASTE Frank W. Curtis	74
Coming Meetings	72
Letters from the President No. 2, Service of Your National Officials	61
Obituaries	65
Program Personalities	66
Situations Wanted	65

National Officers, committeemen and staff personnel meet for dinner following all-day sessions of National Committees at Fort Shelby Hotel, Detroit

cation and National Standards Committees.

The former group, chairmanned by O. W. Winter, is proceeding in a cooperative arrangement with the New York State Vocational and Practical Arts Association to complete the two books of Volume I of a text on elementary jig and fixture design.

A series of tool engineering texts, at college level, is planned to thoroughly cover the seven primary subjects: Manufacturing Analysis, Machining Tools, Sheet Metal, Forging, Die Molding, Quality Control and Gaging, Welding, and possibly Woodworking.

Will Be Used in R.I.T. Course

Arrangements have been made with Rochester Institute of Technology to prepare suitable material on "Manufacturing Analysis," to be tested in the R.I.T. tool engineering course initiated with the assistance of ASTE.

Both textbook undertakings will be self-sustaining from sales of the publications, and both will be useful to Society members as home study courses and for reference.

Other activities which the Education Committee hopes to inaugurate include: Society certification of tool engineering courses and approval of apprentice programs, securing educators to speak at local and National Society meetings, and publication of articles clarifying the profession of tool engineering, in technical and general circulation magazines and engineering school papers.

Sub-committee chairmanships announced by Mr. Winter are: Tool Engineering Course, Prof. Halsey F. Owen; Tool Engineering Literature Review, Sherman B. Hagberg; Tool Engineering Visual Aids, August C. Arends; Tool Engineering Apprentice, Charles C. Gorham; Tool Engineering Student, Foster M. Crayton; Tool Engineering Vocational, Richard F. Kipers, of the faculty of Rochester Institute of Technology, Rochester, N. Y., a newly appointed committeeman; and Tool Engineering Qualifications, C. Douglas Wright.

New Standardization Project

Newest enterprise of the National Standards Committee, Chairman W. H. Smila reported, is the formulation of 20 major standards for small tools, machines and accessories, several Chapters participating in each project:

Turning, Boring and Facing—Montreal, Schenectady, Twin States, Portland (Me.) and Boston; Milling—Racine, Milwaukee, Fond du Lac, Twin Cities and Lakehead; Broaching; and Drilling, Reaming, Counterboring, Spotfacing, etc.—Toledo, Windsor, Detroit, Pontiac and Flint.

Threading; and Forging Equipment and Procedure — Dayton, Columbus, Akron, Cleveland and Pittsburgh; Grinding and Other Abrasive Operations—Worcester, Little Rhody, Springfield (Mass.) and Hartford; Planing, Shaping and Slotting—Kansas City, Wichita, St. Louis, Evansville and Louisville.

Gears and Splines; and Equipment—Rockford, Fox River Valley, Chicago, South Bend and Grand Rapids; Press Room Operations—Erie, Buffalo-Niagara Frontier, Niagara District, Toronto and Hamilton.

Joining Processes — Golden Gate, Seattle, Portland (Ore.), Los Angeles, San Diego and Phoenix; Heat Treating Equipment and Procedures; and Shop Lubrication—Central Penna., Potomac, Baltimore and Philadelphia; Molding, Extruding and Die Casting—Greater New York, New Haven, Fairfield County and Northern New Jersey.

Foundry Equipment and Procedures; Miscellaneous Processes; and Procedures —Springfield (Ill.), Decatur, Tri-Cities, Peoria and Cedar Rapids; Inspection and Testing Equipment and Procedures—Syracuse, Rochester, Elmira, Binghamton and Williamsport.

Machine Tools — Cincinnati, Fort Wayne, Richmond, Indianapolis and Muncie; and Material Handling—North Texas, Houston, New Orleans, Atlanta and Nashville.

To Issue Tracings

The Standards Committee also plans to issue master data sheets (tracings) for blueprinting dimensions and other data concerning standard and common machine tools.

In its weekly meetings, the Data Sheet Sub-Committee has developed a numerical index to supersede its preliminary alphabetical index, and has prepared a new sample data sheet for checking proposed data sheets. Assignments have been made to 34 Chapter Standards Committees for contacting 300 prospective users of the data sheet service.

More frequent mailings of data sheets are planned, with monthly distribution expected by 1948. All Society data sheets are to be supplied to engineering colleges on request, Mr. Smila reported.

The sub-committee for editing technical data is at work on 14 sheets of factual information on cutting tools, practices and techniques, and anticipates handling many more.

The ASTE Canadian Standards Committee is engaged in a program of issuing data sheets furnished by Canadian manufacturers for use within the Dominion.

Recommendations for Society appointments to ASA Committees will be made, Mr. Smila indicated, ASTE being a member organization.

Reports of the National Public Relations, Membership, and Editorial Committees followed substantially the recommendations made in their summer meetings and reported in the October issue of *The Tool Engineer*.

New Chapters Anticipated

Membership Chairman E. W. Dickett quoted membership figures indicating only 9% decrease from the wartime peak, with a new Chapter at Poughkeepsie, two others in prospect at Madison, Wis., and Youngstown, Ohio, and accelerated activity in 13 other industrial cities. The Board formally accepted the 1257 members elected since its April meeting.

W. B. McClellan, National Editorial Chairman, gave an encouraging report showing steady growth and acceptance of *The Tool Engineer*, its healthy financial condition and contribution to the Society's income.

E. Wayne Kay, Chairman of the ASTE Directory Committee, announced plans for the 1947-48 edition whose preparation is to be incorporated in the functions of the National Editorial Committee. He reported in detail on the publication of the current roster, delayed through labor disputes in the printing industry and other reconversion problems.

The National Program Committee, represented by H. D. Hall, Chairman, presented a lengthy breakdown of functions and duties of both National and Chapter units, for incorporation in the Procedures.

The Committee's preliminary plans for the Houston meeting in March are announced elsewhere in this issue.

Procedures Revised

A heavy volume of work was evident in recommendations by the National Constitution and By-Laws Committee for revisions and additions to 13 sections of the Procedures. The requested changes and innovations were all approved by the Board.

Chairman Ray H. Morris announced the appointment of Charles G. Adams, Managing Partner, Twin City Die Casting Co., Minneapolis, to replace the late George W. Wise, also of Twin City Chapter. Douglas R. Cooper, Dept. Manager, Canadian Fairbanks-Morse Co., Ltd., Toronto, will serve as Canadian representative on the Committee.

Approximately 130 qualified authors are at work on the "Tool Engineers' Handbook," E. W. Ernst, Handbook Committee Chairman, reported. Only 72

pages remain unassigned for the preparation of a manual whose contents will include much hitherto unpublished material.

Advertising and distribution plans are being developed jointly by the Committee and the publishing company, Mr. Ernst added.

Must Clarify Engineering Status

In its preliminary study of the Professional Engineers Acts appearing on the statute books of 46 states and seven Canadian provinces, the Committee on Professional Engineering, chairmanned by R. B. Douglas, found that extensive background research is necessary to clarify the status of engineering.

The long-existing legislation, drawn up by members of the older branches of engineering, effectively excludes newer and equally valid fields.

The laws not only debar legitimate practice of tool engineering and many other phases of the engineering profession, but they establish qualifying standards on evidence of formal education rather than on the basis of demonstrated competence.

Careful consideration of all the elements and a program of analysis and education should be undertaken before any attempt is made to secure liberalization of the Acts, Mr. Douglas recommended to the Board.

The Honor Awards Committee, which Mr. Douglas also heads, has made considerable progress in obtaining endowments for awards in tool engineering.

The Society has accepted the generous offer of the James F. Lincoln Arc Welding Foundation to present an annual award for an outstanding contribution to *The Tool Engineer* on the subject of Arc Welding. A medal for this award is already in process.

W. A. Dawson, Assistant Secretary-Treasurer, acted for Mr. Douglas in preparing the report of the National Secretary, in the latter's absence on a European business trip. His account of the state of the Society recorded encouraging progress in activities, services, and stabilization of membership.

Assets Tripled

Significant in the report of V. H. Ericson, National Treasurer, was the tripling of the Society's assets during the past year, largely through income from the New Era Exposition and *The Tool Engineer*. The comprehensive statement and audit gave a complete breakdown of each department of the Society's operation, verifying its strong financial position.

The Judicial Committee, composed of the nine Past Presidents oldest in term of office, made its first formal report to the Board through its Chairman, J. A. Siegel, first President of the Society.

The Committee's stated function is to "render a final decision regarding an interpretation of the Constitution and By-Laws in cases where the interpretation of the National Constitution and By-Laws Committee is not accepted."

In a talk before the Committee, President Sargent suggested that the group serve as good will ambassadors among the Chapters and to other organizations. The individual prestige of the Committee members would lend weight to their opinions and activities, Mr. Sargent emphasized.

The Committee may also present, through the proper channels, suggestions for such changes and improvements in the existing By-Laws and Society functions as it feels necessary.

Officers chosen, in addition to the Chairman, are: W. H. Smila, Vice-Chairman, and T. B. Carpenter, Secretary.

H. E. Conrad, Executive Secretary, described the new Central Office setup, relating in detail many of the operations performed.

Accounting is now on a current basis and all membership applications in good order are processed on the day received, the Board was told.

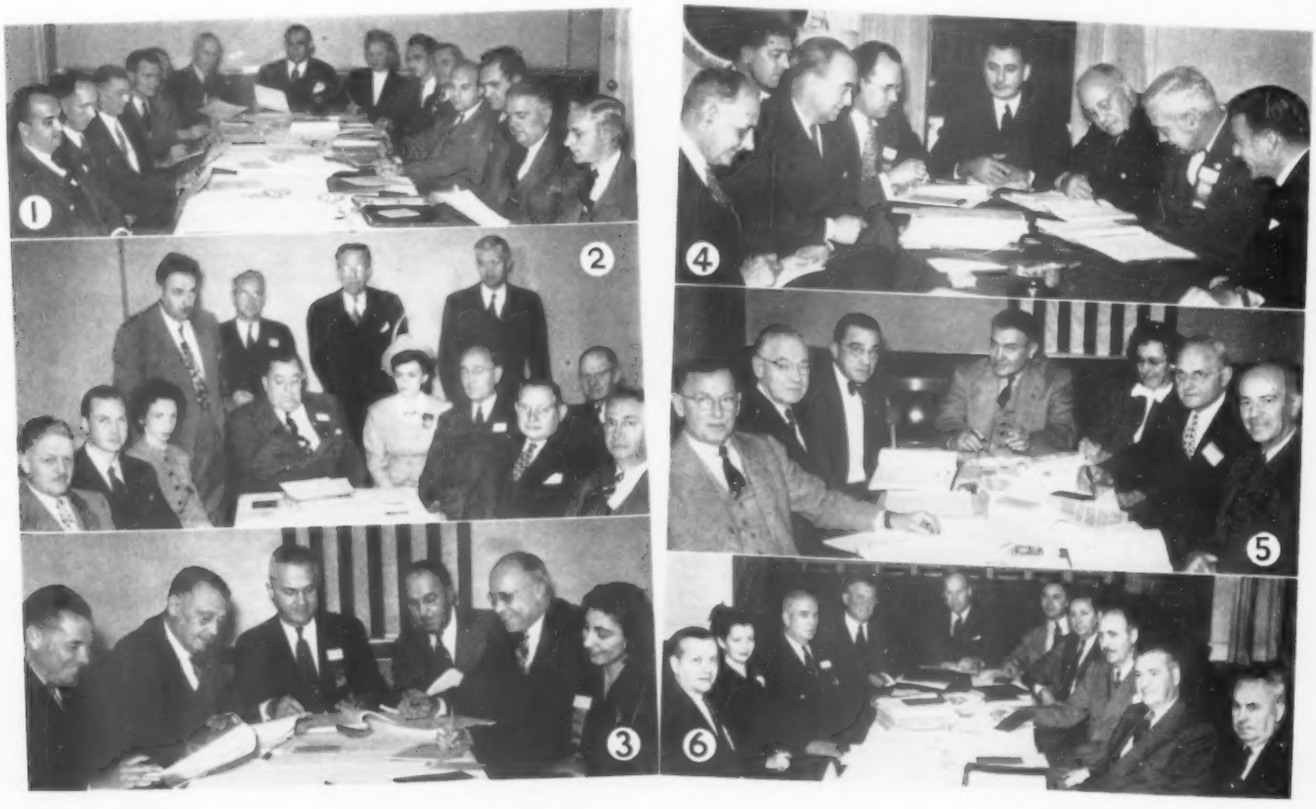
New services inaugurated include the issuing of information on the Society's activities to the membership, press, and other organizations; and the facilities for bulk mailings and letterhead printing available to Chapters.

Membership Certificate Popular

The new membership certificate, Mr. Conrad stated, has met with ready acceptance, 1089 orders being received in the first few weeks following its announcement. Distribution of the "Code of Ethics" and "Tool Engineer's Pledge," too, resulted in many expressions of appreciation on the part of the membership.

Assisting Mr. Sargent in the conduct of the meeting were W. B. Peirce, First

Six ASTE National Committees met in Detroit October 25, preliminary to the semi-annual Directors' meeting the following day. 1. Education Committee group (left to right): A. S. Elston, F. M. Crayton, Halsey Owen, C. A. Vogt, L. A. Sheeran, C. C. Gorham, O. W. Winter, Chm.; Maxsine Erickson, meeting secretary; C. D. Wright, A. C. Arends, M. L. Roessel, R. F. Kipers, S. B. Hagberg and E. M. Bertschi. 2. Editorial: E. W. Kay, J. A. Lapham, Elizabeth Stander, meeting secretary; K. C. Jasper, H. D. Hall, W. B. McClellan, Chm.; H. L. Tigges, D. B. Pratt, R. B. Powers, W. B. Peirce, M. J. Radecki, A. E. Rylander and F. C. Koehn. 3. Judicial: T. B. Carpenter, W. H. Smila, J. A. Siegel, Chm.; W. F. Wagner, F. W. Curtis and Sara Kasparian, meeting secretary. 4. Handbook: C. F. Worfolk, A. L. Potter, F. W. Wilson, B. C. Brosheer, E. W. Ernst, Chm.; F. W. Curtis, Frank Martindell and R. B. Douglas. 5. Constitution and By-Laws: E. J. Berry, H. R. Wentzell, J. J. Demuth, R. H. Morris, Chm.; Dorothy Meyer, meeting secretary; T. J. Donovan, Jr., and E. W. DeBisschop. 6. Membership: E. W. Dickett, Chm.; Edythe Reichart, Secretary to Committee; I. F. Holland, Fred J. Dawless, C. John Lindegren, M. M. Ross, J. C. Knight, J. I. Junkin, H. F. Volz and H. D. Mozeen



Vice-President, and I. F. Holland, Third Vice-President, who took the chair to receive reports of the committees under their direction. The three presiding officers also reported on their own activities in visiting Chapters, attending regional meetings and helping the local groups in various ways.

In addition to the National Officers, attendance at the meeting included Directors H. E. Collins (Houston), C. B. Cole (Chicago), Grant S. Wilcox, Jr. (Detroit) and A. M. Schmit (Toledo), the several National Committee Chairmen, a number of their committeemen, and representatives of the Central Office and *Tool Engineer* staffs.

F. E. Doty, Jr., National Program Committeeman, and Homer Briggs, First Vice-Chairman of Houston Chapter, reported local plans for entertaining the Society at the Annual Meeting in March, and answered questions from the Directors concerning the facilities of the host city.

Dates established for the Texas convention are March 19-20-21-22, 1947.

On the day preceding the Board session, the Editorial, Education, Constitution and By-Laws, Membership, Judicial, and Handbook Committees met, the latter group holding a three-day conference.

The meetings, originally planned for Pittsburgh, were rescheduled at Detroit following cancellation of the fall convention in the strike-bound Pennsylvania city.

Precision Casting Permits New Freedom of Design

Hartford, Conn.—For the production of intricate castings, from alloys difficult to machine, where accurate dimensions, surface smoothness and sound structure are essential, precision casting is a must, Albert W. Merrick, Chief Metallurgist, Austenal Laboratories, Inc., stressed in a talk on this subject at a meeting of Hartford Chapter, held October 7 in the Hartford Gas Co. Auditorium.

Originated as a means of casting dentures, surgical and orthopedic appliances, and jewelry specialties, the process, Mr. Merrick stated, was brought to maturity by the overwhelming demands of war.

Its success in exacting ordnance applications, he added, is leading manufacturers to use precision castings of old and new alloys for parts virtually impossible to produce by forging and machining methods.

Unlimited by restrictions imposed in established machining practices, the engineer can design unconventional or involved shapes, including complicated internal coring, that would be the despair of any machine shop.

Mr. Merrick explained in detail the making of precision castings from metal pattern to finished product, including investment molding by the "lost wax" process; practical applications and close tolerances obtainable.

Expensive machine tool equipment, dies, jigs and fixtures are not required for volume production by this process, the speaker emphasized.

This new contribution to the art of founding holds many untouched possibilities for future development, he predicted.

The technical session was preceded by a dinner at the Hartford City Club. In a film-illustrated talk, Roxy Short, of the Sikorsky Corp., described his trip to Mexico, over Paracutin Mountain.

Engineers in Government

The November election of Ralph E. Flanders distinguished industrialist, member of ASTE, and now Senator-Elect from Vermont, raises the question of why so few engineers offer themselves for public office.

Another successful candidate from the engineering profession, The Honorable Carl Hinshaw, Associate Member, ASCE; and M.C., House of Representatives; said in a recent speech:

"Engineers make splendid executives in government, but rarely are they found in positions of highest authority. Those positions are most frequently held by lawyers. Why is that so? I think it is because lawyers are trained in public speaking and in thinking while speaking.

". . . In addition to their basic training in the law, they must achieve a widely diversified knowledge, even though it may only be a smattering of knowledge, in many other fields. The engineer, on the other hand, generally confines himself to intensive specialization in his chosen branch of engineering.

". . . But is the conception, design, and execution of projects the limit of his mission in life? I say no. If he limits himself to those things, the engineer is merely a servant of others in authority. To achieve his highest usefulness to our society, the engineer should himself achieve authority in the affairs of society.

"His highly trained hand, his resourceful mind, and his inherent integrity are needed in positions of authority, to direct the collective efforts of society—to avoid waste, to advance the most useful ideas, to sway public opinion toward good works, to 'run interference' for the advancement of the welfare of society.

"Politics is far from being an exact science, and in many aspects it is not even logical. The logical, precise mind of an engineer is likely to shrink from politics as unworthy of his talents. That is where the engineer makes a great mistake. In avoiding politics he is depriving his community, his state, and his country of a type of leadership that is sorely needed.

"Each part of our country has important questions to decide that can be presented expertly by engineers. Let them learn to speak, and to speak out the truths they learn and know instead of waiting modestly to be consulted. People need to know such basic truths to guide them in their political expressions.

"Politics is just what good citizens permit it to be. Merely casting your ballot is not enough to square you with your duty as a citizen. Citizenship is a precious privilege that you must work at to deserve."

Are we taking for granted the precious privilege of citizenship so eagerly seized upon by millions in countries recently liberated from the grip of dictatorship?

Special Train Chartered for Houston Meeting

Detroit, Mich.—A special train to speed ASTE members to the Annual Meeting at Houston, Texas, March 19-20-21-22, may be chartered by the Society, with the cooperation of the Alton Railroad, Missouri Pacific Lines, and the Pacific Railway, according to a recent announcement by H. E. Conrad, ASTE Executive Secretary.

Texas has attractive scenery like this

The train will depart from Chicago at 10:15 A.M., Tuesday, March 18, and from St. Louis at 3:45 P.M. that afternoon, arriving in Houston at 11:00 A.M. the following morning, several hours ahead of the regularly scheduled service and in time for convention-goers to register for the opening session Wednesday afternoon.

An optional return, via New Orleans, is available at no extra charge. Other side trips to San Antonio and Brownsville, Texas, and Mexico City, D.F., can be arranged at low cost when purchasing round trip tickets.

A minimum of 200 reservations, from either Chicago or St. Louis, is necessary to guarantee the special train which can be made up of all-bedroom or all-roomette cars or whatever equipment the Society requests. Two diners and two club cars will be carried.

With 1000 rooms being offered by Houston hotels, ladies can, for the first time in several years, be comfortably accommodated at a Society convention.

The sunny warmth of the late Texas winter makes this a delightful time for a family vacation, with a possible excursion into Old Mexico.

The Houston Chapter Committee plans to entertain the Society royally, with an all-day rodeo and barbecue at a ranch 20 miles from town substituting for the usual banquet, on Saturday, "Texas Day." Installation of National Officers and other Annual Meeting ceremonies will take place on this occasion.

Other proposed events include a sightseeing trip around Houston, a visit to the nearby San Jacinto Battleground and monument where Sam Houston routed the Mexicans under Santa Ana; and a style show, matinee, and bridge games for the ladies.

These activities will be in addition to the customary technical sessions, business meetings and plant tours. The National Program Committee is making final arrangements and will shortly announce its plans.

LETTERS *from the President*

No. 2. Service of Your National Officials

Greetings:

At this time let us discuss together the organization of the general management of your Society, before going on to the question of dues in relation to Society services. The two are closely related, but there is so much I want to tell you of the work of your National Officers and Central Office, that perhaps it will clarify our understanding of each if we treat them separately.

Let us first take a look at the make-up of our Society. We have a membership body of approximately 18,000, and are still growing fast. Last year we took in over 2000 new members, and most opinions were that we would suffer a sharp drop-off along with the shrinkage of extraordinary war production.

With a few exceptions, those 18,000 members are grouped into 74 Chapters in as many manufacturing centers, throughout the United States and Canada. The 74th was recently chartered at Poughkeepsie, New York, and outstanding applications for Chapter charters have been received from several other localities.

* * *

Each of these 74 Chapters is a miniature Society within itself, ranging from less than a hundred to well over a thousand affiliates, serving its individual member, its local industry and community, through its elected officers, appointed committees, monthly meetings, lectures, and other programs and activities.

The outstanding thing about these local organizations is that they are all moving toward the same objectives, and, with the same singleness of purpose, striving for ever higher ideals of professional service.

In that unity lies their strength. Without it, many of them would not have come into being; some of them could not continue to exist; the remainder would find their horizons narrowly circumscribed. But with it, they unitedly constitute the strongest and most vigorous professional body within our industrial society.

That unity of purpose in service is provided by the National Organization about which I want to give you a few facts not incorporated in the Procedures.

* * *

As you know, you have seven elected officers, each of whom has supervision over one or more of the 14 National standing or special committees.

In these committees are developed the specialized policies which govern your Society and keep it in harmony with the aims for which it was set up, and which help to steer the local Chapters through the complexities of State, Provincial, and local laws and by-laws, not to mention conflicting social forces and special interests.

Through these committees, too, are carried on the centralized National activities, such as the publication of your magazine, preparation of your Handbook, standards, education and the constant search for better programs.

These committees may meet weekly, monthly, quarterly or semi-annually, but each officer is expected to attend the meeting of each committee under his supervision, as are each one of the hard working committee members, regardless of the location of the meeting place, or personal business demands.

If this were not enough, each officer is expected to attend as many monthly Chapter meetings as possible. Both you and your National Officers are anxious that this be so in order to keep your Chapter-National relations on as personal a basis as possible.

* * *

Obviously, we have grown so large that it is no longer possible to attend all Chapters within a single year's tenure of office. Were all the meetings held on consecutive nights, and were they all within easy reach of each other, it would take well over two whole months to visit the entire 74 Chapters.

Fortunately for the Society, but unfortunately for the individuals concerned, your officers are men chosen by you for their administrative ability from the top ranks of the nation's industry, and are uncommonly burdened down with heavy responsibilities in their respective companies. To these companies we all owe a debt of gratitude for their generous cooperation in promoting the aims of the Society.

It is not at all unusual for your National Officers and National Committee Chairmen to devote from 50-80 per cent of their time and energies to the service of your Society. Not one of these men draws one cent of reimbursement for his efforts—many even donating traveling and other expenses to the Society.

I would venture, as a guess, that the contributed time alone, if computed at the cost to the organizations employing these officers, would be greater than the combined dues payment of all the membership of the Society.

* * *

For their loyalty and unselfish devotion to the service of the Society and your larger professional interests, as President, I salute these men and ask that you be not unmindful of their efforts in your dealings with them. I am not asking that you condone laxity or inefficiency on the part of your officers, nor do they, whatever the burden they are carrying—far from it.

Be ruthless. Be critical. Demand that your elected officers and your Committee Chairmen, in both Chapter and National Organizations, have clearly before them the goals of the Society and their particular activities; demand that they have concrete and practical plans for achieving those goals; demand that they be unrelenting in their efforts to translate those plans into action.

At the same time, you and every other member have a solemn obligation to choose your officers wisely, voting only for men whom you know to be capable of discharging the responsibilities, then giving them your enthusiastic support.

If you do this, as a Society "we cannot hope too much nor dare too much."

A. M. SARGENT, *President*,
American Society of Tool Engineers

Weeks Stresses Carbides, Advantages, Applications

St. Louis, Mo.—An audience of 175 members and guests of St. Louis Chapter heard R. B. Weeks, District Sales Manager for Kennametal, Inc., lecture on "Composition, Design and Use of Cutting Tools," at a dinner meeting, October 3, in the Melbourne Hotel.

Mr. Weeks gave a very comprehensive talk on the application of carbide cutting tools, explaining in detail the advantages of clamped-down tool bits, particularly the difference in expansion between the carbide and the base metal.

Charles H. Compton, Head Librarian of the St. Louis Public Libraries, was a guest of the Chapter. He expressed his appreciation for the technical books recently contributed by the Chapter, through Harvey Essmann and Harry Ball of the Education Committee.

Charles H. Compton (left), Head Librarian of the St. Louis Public Libraries, examines technical books presented by Harry Ball (standing) and Harvey Essman of the St. Louis Chapter Education Committee. Mr. Compton expressed warm appreciation for the first gift of its kind made to the local libraries by an organization

Mr. Compton stated that this was the first time any organization had ever made a gift of this nature to the local public libraries. The Chapter expects to continue advancing the educational opportunities of young tool engineers in this manner.

Willis Ehrhardt, Chapter Delegate, reported on the activities of the Delegates and National Officers.

Farrell With Bunell

Cleveland, Ohio — Ronald J. Farrell, formerly Project Engineer for A. W. Hecker Co., is now associated with The Bunell Machine and Tool Co. as Sales Engineer.

R. J. Farrell

Mr. Farrell is widely experienced in tool design and is a consultant on special machinery and dies. He is especially well known in New York and Pennsylvania.

A member of Cleveland Chapter, ASTE, he is serving in a technical capacity under R. J. Swing, General Sales Manager of the Bunell company.

Upper left: Officers of the new Mid-Hudson Chapter are installed by I. F. Holland, Second Vice-President. Left to right: Mr. Holland, John L. Petz, Chairman; William Freer, First Vice-Chairman; Noel de Cardova, Second Vice-Chairman; L. H. Tenney, Secretary; and Thomas Bircher, Treasurer. Below is part of the dinner group of 154 members and guests present for the November 6 chartering ceremonies at the YMCA, Poughkeepsie, N. Y. Above: Mr. Holland displays 74th Chapter charter to the membership while Chairman Petz looks on proudly

151 Members Granted Charter at Poughkeepsie

Poughkeepsie, N. Y.—In impressive sound-recorded ceremonies, 151 ASTE members were chartered as Mid-Hudson Chapter at a dinner meeting November 6 in the YMCA. This is the 74th Chapter and one of the largest charter groups ever admitted to the Society.

Presentation of the charter and installation of officers were conducted by I. F. Holland, Second Vice-President.

Officers elected by the new Chapter are: Chairman, John L. Petz, Chief Engineer, International Business Machines Corp., Plant 2; First Vice-Chairman, William A. Freer, Production Engineer, Frederick Hart & Co., Inc.; Second Vice-Chairman, Noel de Cordova, Sales Manager, Standard Gage Co., Inc.; Secretary, Lewellyn H. Tenney, Production Engineer, DeLaval Separator Co.; and Treasurer, Thomas H. Bircher, Chief Engineer, United States Hoffman Machinery Corp.

Harry E. Conrad, Executive Secretary, presented to Mr. Petz the Society's gift of a jewelled Chairman pin.

Stresses Membership Value

Guest speaker for the occasion was Ray H. Morris, a Past President of the Society. In his address, "ASTE—a Vital and Functioning Organization," Mr. Morris reviewed the activities of the Society, and emphasized its value to the individual member.

A. E. Rylander, Technical Editor of *The Tool Engineer*, also spoke briefly, congratulating the group on its large initial membership.

The entire proceedings and the voice of each member present were recorded as a historical document.

Inspiration for the formation of a Chapter at Poughkeepsie came to Mr. Petz while attending the ASTE convention at Cleveland last April. Contacting representatives of local and surrounding plants, he invited them to a series of summer meetings which resulted in the organization of the Chapter.

Prominent in the preliminary work, in addition to Mr. Petz and the other elected officers, were: J. H. Keller and D. D. Winslow, DeLaval Separator Co.; T. C. Smith, Frederick Hart & Co., Inc.; F. J. Neumann, Lumb Woodworking Co.; C. P. Ray, Federal Bearing Co.; T. F. Luty, Nilsson Gage Co.; L. Quick, Jas. L. Taylor Mfg. Co.; R. Lansing, Sedgwick Machine Works; L. J. Petz and R. I. Travis, International Business Machines Corp.

Out of town visitors, among the 154 members and guests present at the chartering, included: Julius Schoen, Secretary; Joseph Brady, Publicity Chairman; Eugene Roth, Membership Chairman; and Henry Popp, all of Greater New York Chapter.

Bryan Shows How to Cut Production Costs

St. Charles, Ill.—Clare Bryan, Chief Consulting Tool Engineer for the Link-Belt Co., Chicago, was principal speaker at the dinner meeting of Fox River Valley Chapter, in Hotel Baker, October 2.

Because of increased labor and material costs, manufacturers today more than ever are striving to lower production costs, Mr. Bryan said, emphasizing that the tool engineer plays an important part toward this end.

By way of example, he presented a slide lecture describing effective tool records and tool crib controls, with standardized tools and fixtures used wherever possible. The speaker pointed out that, in its various plants, Link-Belt localizes fabrication of each type of product to concentrate manufacturing ability in a particular factory.

Further slides depicted jigs, fixtures and tools for various milling, drilling and boring operations. Related to this, the use of standardized hydraulic clamping devices was shown to save approximately 80% of floor to floor time as compared with clamping the work by using blocks, bars and studs, and tightening nuts by hand.

The use of Meehanite bushings as pilot guides was suggested by Mr. Bryan. This he recommended as superior to bronze bushings, both as to consistent wear resistance and accuracy duplication. He also stated that carbide tooling is used by his company wherever feasible, to reduce metal removing time.

Prior to Mr. Bryan's lecture, guests from Rockford and Chicago Chapters were introduced by Chairman Braun.

Greenshields and Schmidt Promoted by Budd

Detroit, Mich. — Two tool engineers who have worked together for many years shared promotions recently when Robert O. Greenshields, Chief Tool Designer for The Budd Co., was made Works Manager of the Wheel Div., and Ottmar Schmidt, Assistant Chief Tool Designer, stepped into the post left vacant by Mr. Greenshields' advancement.

Ottmar Schmidt

R. O. Greenshields

Both men came to The Budd Co. 18 years ago from Continental Motors Corp. where they were tool designers. Both are affiliated with Detroit Chapter, ASTE. Mr. Greenshields is a member of the Engineering Society of Detroit.

Werner and Hawkins Form Partnership

Detroit, Mich.—Arnold J. Werner, Detroit District Sales Manager for The John S. Barnes Corp. of Rockford, Ill., and Ernest C. Hawkins, former manager of the Barnes sales office in Newark, N. J., have organized the Arnold J. Werner Co., with offices in Detroit.

The new concern will represent, in addition to the Barnes Corp., the A. B. Farquhar Co. of York, Pa.; and the Avco Tool and Machine Div. of The Aviation Corp., Toledo, Ohio.

Mr. Werner will continue to manage the Detroit office of the Barnes company, but Mr. Hawkins will devote his entire efforts to the new firm.

Both partners are members of Detroit Chapter, ASTE.

Sixty-five New England officers participated in fall regional conference at Hotel Bridgeway, Springfield, Mass. 1. A delegate asks a question during discussion period. 2 and 3. Worcester and Boston groups. 4. Conducting the meeting are (left to right): R. H. Morris, Natl. Constitution and By-Laws Chm.; W. W. Young, 2nd V. Chm., Boston Chapter; E. J. Berry, Constitution and By-Laws Chm., Little Rhody Chapter; I. F. Holland, 2nd V. Pres.; A. M. Sargent, Pres.; and V. H. Ericson, Natl. Treas. 5 and 6. Portland and Springfield delegates. 7. Among Chapter Chairmen present were (standing, left to right): A. C. White, Little Rhody; W. E. Farrell, Twin States; J. B. Savits, Boston; and C. J. Gluck, Fairfield Cty. Seated: A. T. Warman, Worcester; F. A. Shute, New Haven, and Edmond Morancey, Hartford. All-day meeting was held October 6.

New England Sends Large Delegation to Regional Meeting

ONE OF the most successful of the ASTE fall regional meetings took place October 6 when 65 New England Chapter representatives and National Officers gathered at Hotel Bridgeway, Springfield, Mass.

Second Vice-President I. F. Holland presided and introduced President A. M. Sargent who indicated that the Society's growth had reached a point where European Chapters were a possibility. In the next decade, he estimated, Society membership may reach 30,000.

Suggests Committee Rotation

Ray H. Morris, National Constitution and By-Laws Chairman, emphasized that changes in the Constitution should not be lightly considered, but that the By-Laws are flexible and more easily amended. He also suggested rotation of the personnel of Chapter Committees, following the pattern of the National Committee setup, for continuity of thought and action.

In urging greater familiarity with the Society Procedures, Mr. Holland recommended the program originated by Houston Chapter and since adopted by a number of other groups. Under this plan, the Chapter executives devote several evenings to a study of the operational guides, taking up the procedures for one committee at each meeting.

Mr. Holland reported for Chairman W. H. Smila on the current standardization project of the National Standards Committee.

Fred Dawless and John Lindegren, of the National Membership Committee, spoke on the objectives of that group. Mr. Lindegren requested a closer perusal of membership applications by Chapter Executive Committees, and suggested a container filled with membership application blanks and descriptive literature, for the benefit of visitors at Chapter meetings.

Good programs, stressed Past President Frank W. Curtis, are the Chapter's sales commodity and the Society's principal source of future growth. As Co-Chairman of the Handbook Committee, he gave a summary of the status of the "Tool Engineers' Handbook."

The National Public Relations Committee was defined as "a watchdog of trends and a preserver of good relations between ASTE and the external world," by W. W. Young of that Committee. A program to develop consciousness of community importance, both within the membership and among the general public, is one of the aims of this group, he said.

Michael J. Radecki, of the National Editorial Committee, commented on the Committee's administration of *The Tool Engineer* and gave instructions for submitting contributions to the *ASTE News* section.

Lack of tool engineering textbooks, reported Charles C. Gorham of the National Education Committee, has deferred progress in the institution of university courses. His Committee plans to furnish texts to the first university inaugurating such a program.

T. E. Lecture Course at M.I.T.

Early next year, he announced, a five-lecture tool engineering course is to be given at M.I.T., with Frank W. Curtis delivering two of the lectures.

Others who spoke briefly included Past Presidents James R. Weaver and Robert M. Lippard, and National Treasurer V. H. Ericson.

A general discussion followed the submitting of reports, with President Sargent and other officers answering the delegates' questions.

Among other officers attending the conference were: E. J. Berry, National Constitution and By-Laws Committee; Lloyd Sheeran of the National Education Committee, New England Chapter Chairmen: Charles J. Gluck, Fairfield County; Edmond Morancey, Hartford; A. T. Warman, Worcester; Charles H. Stonerod, Springfield; J. B. Savits, Boston; William E. Farrell, Twin States; Merton C. Corson, Portland; Frank A. Shute, New Haven; and Arnold C. White, Little Rhody, and most of the Committee Chairmen from the Chapters represented.

Flanders Goes to Senate

Springfield, Vt.—An easy winner in the November 5 elections, Ralph E. Flanders, Chairman of the Board, Jones & Lamson Machine Co., and Twin States Chapter ASTE member, goes to Washington as Republican Senator from Vermont.

R. E. Flanders

Commenting on Mr. Flanders' activities as Chairman of the Research Div. of the Committee for Economic Development, "the aggressive and moderately progressive organization of businessmen, one of whose efforts is to instill some modern thinking into the opaque ranks of reaction," Blair Moody, Washington newspaper correspondent, says, "Flanders will lift the intellectual level of the Senate."

The New England industrialist and retired president of the Federal Reserve Bank of Boston has business, professional and civic associations too numerous and well-known to be listed.

Another recent honor was the award of an Honorary Membership in ASME, of which Mr. Flanders is a former president, conferred at the organization's fall meeting in Boston.

Van Deventer Urges Economic Education to Save Industrial System

"WHAT WE need most in this country today is more economic literacy. We need it more than we need, as some one once said, 'a good five-cent cigar.' If we had economic literacy, we might, indeed, find that it would lead us to the good nickel smoke, and to the resurrection of the fifty-cent haircut."

J. H. Van Deventer

With these words, John H. Van Deventer, Chairman of the Business Press Div. of the Committee for Economic Development, keynoted his address before a meeting of Fort Wayne Chapter, October 9, in the Chamber of Commerce Building.

"When I was a boy," said Mr. Van Deventer, "a haircut cost 25c, without a tip, and it was mostly without. Today you pay anywhere from 75c to $1.00 for the same service. The method and tools employed today are exactly the same as those used then.

Cars Would Be Few

"If the process of making motor cars had improved over the past forty years as little as has the process of removing hair from men's heads, the cheapest car on the market would cost about $4000.00, even outside the black market. And that would mean that very few wage earners would ride to work, or their wives to market.

"Conversely, if some genius would invent a process for restoring the two-bit haircut, the major part of the economic gain would accrue to those having the lower bracket incomes. For after all, there are far fewer capitalists than there are people working for them, and most of them are baldheaded anyway from worrying about losing their money.

"When we begin to think about the social effect of production and mechanization, we are getting beyond design and processing and entering the field of economics."

Need More Economic Research

Quoting Donald David, distinguished dean of the Harvard Graduate School of Business Administration, the speaker observed, "'We all support and should support great technological research. But we have fallen short in economic research. For research in technology, we have spent hundreds of millions of dollars by industry and more recently by Government.

"'Compared with that, pathetic amounts have been brought to the support of research that will help build a society to use that technology for the general welfare, to administer that technology wisely.'"

Unless technological advance is directed to beneficial use, Mr. Van Deventer warned, it may well become a Frankenstein that will prove to be its own ruin, as in the threat of atomics.

"According to its use," he predicted, "we can, with the great machine of production that we call technology, make every one richer in possessions; and, according to its abuse, we can ruin ourselves and destroy civilization.

"Productivity is the big boss of our economic technological machine. But there are two kinds of productivity and they are being confused in the public mind. They are total productivity and individual productivity. Today we have higher total productivity than we have ever had before in this country, and lower individual productivity than we have had during the past ten or fifteen years."

Noting that employment now exceeds 60 million persons, nearly 10 million more than in any so-called period of previous prosperity, he added, "But today it takes about 50 per cent more manhours to turn out an automobile than it did before the war, and unit productivity, measured in hourly or daily output per man, has slipped in almost every line of productive endeavor.

Elements of Prosperity

"There are three indispensable factors to good times: First, high employment; second, good demand backed by purchasing power; and third, high individual productivity. These are the three legs of the economic stool. It can't remain standing when one of them gets weak.

"Today we have the highest level of employment, the greatest potential demand backed by purchasing power, but the third leg, individual productivity, is weak.

"Labor itself has most at stake in maintaining high unit productivity. The man making $500.00 a week does not benefit as much from a 20 per cent reduction in the price of shoes as the man who is making $50.00 a week. And there are a lot more of the latter.

"The men at the top of our principal organized labor groups know this to be true. An extract from *Labor's Monthly Survey*, published by the AFL, reads:

> "'Under our American free enterprise system, workers have made amazing progress in raising their standards of living in the last 30 years. Even after hours of work in industry had been reduced from an average of 54½ per week in 1911 to 40 per week in 1939, the increase in workers' wages was so great that their pay for the shorter week in 1939 was 37 per cent above what they received for the longer week in 1911.
>
> "'With 14½ hours more leisure per week and $450.00 more to spend per year, workers had better homes, better health, more time for their families and greater home comforts, including autos, radios, home appliances, furniture, etc.
>
> "'Living standards do not rise by any magical formula. They can rise only when workers produce more per hour and per year of work. Production, per worker, per year, in all private industry, rose 43 per cent from 1911 to 1939.'"

Contending that capital and labor have very little to quarrel or argue about other than division of the increase in wealth brought about by increased unit productivity, Mr. Van Deventer analyzed: "When there is an increase in real wealth, brought about by increased unit productivity, it should be divided three ways.

All Parties Should Benefit

"One part of it should go to capital which has played its role in providing the technological means without which there could be little unit improvement in productivity. Another part should go to labor, whether or not it was responsible for the initiation of the improvement, on the basis that the wage earners, as a majority, must furnish the principal purchasing power for the products of mass production. A third part should go to the consumers in the form of lower prices.

"There must be certain optimum relationships in such division, which would promote and solidify our general economic welfare and reduce the areas of conflict. But at present, we do not have the faintest idea of what they are or should be. The result is a battle royal in which all three parties are thrown into a ring, and devil take the hindmost.

Ignorance of Correlating Factors

"There is so much that we do not know, even we who have helped build the technological machine, about the way in which it should be operated for the benefit of all of us. I do not believe that employers, in general, realize the vital importance of high wages as a principal support of mass production purchasing power; that labor, in general, appreciates the part that technology has played in advancing its living standards; that Government officials, in general, appreciate the relationship of a balanced budget to wages and profits as well as taxes.

"None of us knows enough about the relationship of wages to prices, otherwise we would not have the present day picture of the cat chasing its tail in a vicious upward spiral."

CED to Disseminate Facts

As a start in the economic education of the masses, Mr. Van Deventer cited the efforts of the Committee for Economic Development, in its current project of distributing information about management-labor and wage and price relations, and the effect of technological advance on living standards.

Reviewing the preliminary work of the CED in planning for high postwar employment, and the survey, "Jobs and Markets," made by its Research Committee, he stressed the high caliber of the organization which has no profit motive and represents no group interest.

The CED program, he believes, will permit all the elements in the economic system to form independent opinions through reason rather than emotion.

Informed Public Can Reason

"I am sufficiently familiar with the intelligence of the average American workman to be confident that, if he has the facts, he will make proper judgment upon them; only that way, in my opinion, lies the hope of preserving a free and progressive economy," he concluded.

After his talk, Mr. Van Deventer entertained questions from the floor in an open discussion of industrial problems.

For the technical feature, Frank Heap, Factory Representative of the Monarch Machine Tool Co., Sidney, Ohio, presented a motion picture showing the manufacture of Monarch lathes, with emphasis on the method of building long life into the machines by flame hardening the ways of the lathe beds.

A second film portrayed many applications of the revolutionary "Shapemaster" lathe, in turning intricate contours. The turning of a perfectly square piece demonstrated the versatility of the machine for producing the odd shapes often demanded in mold work.

A question and answer period followed the presentation of the motion pictures, and samples displayed demonstrated products made from molds formed on the "Shapemaster" lathe.

Obituaries–

Adelbert W. Putnam

Adelbert W. Putnam, Research Engineer for the L. G. S. Spring Clutch Corp., Indianapolis, died September 15 when his racing car crashed during a qualifying run for the American Automobile Association's 100-mile race, at the Indiana State Fairgrounds in that city.

A. W. Putnam

A racing veteran of 15 years, "Al" Putnam was critically injured in 1940 during a race at Syracuse, N. Y. Seven times, he competed in the 500-mile classic at Indianapolis. Like all great race drivers, he had racing in his blood.

Since the beginning of the war he had lived in Indianapolis, having come from Los Angeles six years ago. He was president of the Masonic Pin Club in his company, a member of the Speedway Lodge F. and A. M., the Scottish Rite, Murat Temple Shrine, and the Indianapolis Athletic Club.

His technical society affiliations included ASM, SAE and ASTE. In the latter organization, he had served as Standards Chairman and First Vice-Chairman of Indianapolis Chapter. Nominated for the current chairmanship, he declined the honor because of his racing activities.

Norbert E. Broedling

Norbert E. Broedling, 34, recently passed away at San Diego, Calif., where he had resided for the seven weeks preceding his death.

Mr. Broedling was born in Dayton, Ohio, and attended the schools in that city.

He was employed by the Master Electric Co. and General Motors Frigidaire Corp. at Dayton before moving to Los Angeles in 1939. There he was associated with Erle P. Halliburton Metal Products Div. and Harvey Machine Co.

At San Diego he had joined the engineering staff of a local machine company shortly before his death.

Mr. Broedling first became a member of Dayton Chapter, ASTE, later transferring to Los Angeles. He had planned to affiliate with San Diego Chapter after removing to that city.

Frank C. Deli

Frank C. Deli, 59, Director of Production and Research at the Autopoint Co., Chicago, Ill., died of a heart attack, October 4, while on a trip to Houghton, Mich. Had he lived until October 10, he would have reached his 60th birthday.

Mr. Deli was born in Transylvania, a small German colony, belonging at one time to Austria-Hungary, and now to Romania. He was tutored by his father, a Lutheran minister, and later apprenticed as a machinist.

In 1903 he came to this country and worked as a machinist and toolmaker in a number of Pennsylvania industrial plants.

From there he moved to Chicago and completed his technical training at Schurz, Crane and Lewis Institute.

He was subsequently employed by several Chicago concerns and by Standard Steel Car Co., Hammond, Ind.; Christensen Machine Co., Racine, Wis., and Black & Thomas Co., Minneapolis, Minn.

In 1921 he founded the Composition Products Co. which later became the Realite Co., Realite Mfg. Co., Autopoint Products Co. and now the present Autopoint Co.

He was a member of Albany Park Masonic Lodge, the Men's Club of the Peoples Church, the Tool and Die Institute, and an early affiliate of Chicago Chapter, ASTE.

John W. Petersen

John W. Petersen, 62, Chief Tool Designer at the Delco Appliance Div., General Motors Corp., Rochester, N. Y., passed away October 11, from complications following a major operation.

J. W. Petersen

Mr. Petersen served his apprenticeship at the Dursland Machine Works in Denmark. He entered the automotive industry in America, in the tooling divisions, when it was still in its infancy. Starting at the Pierce Engine Co. of Racine, Wis., he transferred to the Mitchel Motor Car Co., also of Racine, then to the Nash Motor Co. of Kenosha, and the Russell Motor Car Co. of Toronto and Buffalo.

Following World War I, he moved to Rochester and served eight years at the North East Electric Co. and five years at the Gleason Works, before assuming in 1936 the position held at the time of his passing.

Mr. Petersen was a staunch supporter of ASTE and a charter member of Rochester Chapter.

William Pfeil

William Pfeil, President of the American Broach Sales Co., Toledo, Ohio, died of a heart attack at his farm in Decker, Mich. Mr. Pfeil's home was in Temperance, Mich., where he had moved from Ann Arbor. He was born in Bad Axe, Mich., 60 years ago.

William Pfeil

Mr. Pfeil had been affiliated with the American Broach and Machine Co., Ann Arbor, for 28 years.

He was a member of Toledo Chapter, ASTE.

Situations Wanted

INDUSTRIAL ENGINEER desires situation in Detroit area as Sales Engineer with well-established firm dealing in machines, tools or related equipment. Has 16 years of practical experience with machines, tools and application of same to efficient production methods. Member ASTE and ESD. Has good contacts. Address replies to Box 105, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

MECHANICAL ENGINEER — Specialized in redesign of product to fit production basis; designing tools for manufacture, production line layout; setting up inspection systems; coordination with other projects, and experimental work. Experienced in manufacture of motion picture equipment, electric motors and appliances, tools and dies. Education includes courses in mechanical, electrical, production and optical engineering. Recently discharged from AAF. Available immediately to go anywhere in U. S. Write Box 104, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

TOOL ENGINEER — 38, married, 20 years' diversified experience—tool and die design, metal stampings and drop forgings, methods processing, plant layout, plant engineering for production of automobiles, radios, refrigerators, aircraft and railroad equipment. Available immediately. Detroit area preferred. Write Box 106, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

Society President Addresses Lousiana Group

Guest speaker at a recent meeting of New Orleans Chapter in St. Charles Hotel, was A. M. Sargent, ASTE President. Mr. Sargent stressed the aims of tool engineering in daily living, and related the Society's background and growth. Officers shown at left below are: J. O. Evans, First Vice-Chairman; E. A. Faber, Second Vice-Chairman; E. E. Graf, Chairman, Mr. Sargent, Manuel Novoa, Treasurer; and W. T. Dorvin, Secretary of the Chapter

Golden Gate Chapter members met October 16 in the El Curtola Cafe, Oakland, Calif., to hear W. B. Brotherton, Technical Editor of Ryan Aeronautical Co., speak on Jet Propulsion. Above, left to right, at speakers' table (against photo mural) are: Mr. Brotherton, E. J. Raves, Chairman; I. S. Minetti, Industrial Relations Chairman; H. H. Hagedorn, Treasurer; Harry Dunkel, Victor Carboni, J. H. Moore, Elmer Johnson, G. B. Ashmead, Editor, and B. N. DeRochie, Asst. Publ., *Western Machinery and Steel World*

—Photos courtesy Western Machinery and Steel World

Must Educate Public to Potentialities of New Forces

San Francisco, Calif.—It is the responsibility of science and industry to bring to every American a clear picture of the terrific implications which jet propulsion, atomic energy application and radar have for our future, William P. Brotherton, Technical Editor of Ryan Aeronautical Co., San Diego, told 100 members and guests of Golden Gate Chapter at their meeting October 16 in the El Curtola Cafe, Oakland.

Mr. Brotherton, speaking on "Jet Propulsion and Its Application to Aircraft," outlined scientific developments in machine movements, especially those pertaining to automotive engines, giving concrete illustrations of what may be expected in the future.

Supersonic Speeds

Using the Ryan FR-1 Fireball, the world's first composite engined airplane and first jet engined plane to land aboard a Navy carrier, as an example of the successful military application of jet propulsion, the speaker took his audience into the realm of supersonic speeds with their uncharted imponderables presenting a scientific challenge to the engineer.

In describing problems to be solved when vibrationless speeds of over 1000 mph are attained, he pointed out that there is at present no aircraft available to withstand the terrific forces encountered in these higher speed ranges.

Mr. Brotherton stressed the greatly accelerated efficiency of jet propulsion at high speeds and altitudes and clearly demonstrated the need for further research in coping with the attendant problems.

Optional Propulsion

In conjunction with his address, the speaker presented a film depicting the Fireball with its tremendous climbing power and remarkable speed. One sequence showed the aircraft rushing through the air with its propeller at a standstill.

Another motion picture, "Swaging," was presented by the Standard Machinery Co. of Providence, R. I. This film gave an informative account of the uses of swaging machinery, including unusual applications.

Of especial interest was the swaging of surgical instruments, needles, pencil points and other articles where appearance, strength of material and close tolerance with respect to finished size are necessary.

Program Personalities

In "Special Problems on the Tooling of Precision Instruments," Harold R. Larsen, Chief Engineer, W. & L. E. Gurley, Troy, N. Y., discusses difficulties facing instrument manufacturers.

As an example of his treatment, the one-second Theodolite developed during the war, for Army Engineers, is described briefly with a few remarks as to its design, construction and uses.

H. R. Larsen

Only two manufacturing problems are discussed — the production and testing of optically flat surfaces on metal parts and of precise angles. For the preparation of optically flat surfaces, the use of the lead lap is described. Preparation and maintenance of a lead lap are also explained.

Mr. Larsen includes in his lecture an outline of tooling for the manufacture of limited quantities of precise prisms, and the use of the auto-collimator to assist in checking and adjusting prepared angles to tolerances beyond that obtainable by grinding.

A graduate in Aero Engineering, Mr. Larsen received his M.S. from the University of Minnesota.

He is the author of "The Gurley Four-Inch Army Theodolite" published in "Transactions of 1944 of the American Geophysical Union." His affiliations include ASTM, American Geophysical Union, Institute of Aeronautical Sciences, and the American Meteorological Society.

Mr. Larsen's slide-illustrated lecture requires 30-40 minutes and is available to all Chapters of the Society. Arrangements may be made by addressing him at W. & L. E. Gurley, 514 Fulton St., Troy, N. Y.

ASTE Mayor Guides Industrial Community

Merritton, Ont. — Probably the first ASTE member elected to direct the affairs of his town is Leslie H. Skipper, Mayor of Merritton.

L. H. Skipper

Having a son and daughter, Mayor Skipper is keenly interested in the religious and civic life of the community. A former Sunday School Superintendent, he served two terms on the Town Council before his landslide in the mayorality contest this year.

Mr. Skipper was born in Chatham, Ont., started work as an apprentice tool designer for the Hayes Wheel Co., later joining Hayes Steel Products, Ltd., at Merritton. Now a tool engineer in the Clutch and Universal Joint Division of that company, he is affiliated with Niagara District Chapter, ASTE.

Merritton, a manufacturing town of 3500 population situated on the Welland Canal, has important pulp, paper and automotive industries.

Strict Dimension Control Employed in Auto Plant

Buffalo, N. Y.—September meeting of Buffalo-Niagara Frontier Chapter was held on the 11th at a new location, the Brounschidle Post of the American Legion in Kenmore, N. Y.

Speaker of the evening was Charles Moore, Assistant Master Mechanic, Chevrolet Motor & Axle Div. of General Motors Corp., Buffalo, who discussed "Dimension Control from Raw Material to Finished Product."

In presenting his subject, Mr. Moore described the operations employed in making the Chevrolet connecting rod, outlining methods used by Chevrolet engineers in controlling very accurate limits during all machining sequences. His talk was well illustrated with large scale drawings of each operation on the connecting rod and cap.

Guests from the Chevrolet plant included R. L. Dustman, General Manager, and O. F. Poelke, Master Mechanic.

Says Management Lags On Work Simplification

Elmira, N. Y.—First step in job simplification is an understanding by the design engineer that his creation must lend itself to streamlined manufacturing methods to produce quantities of high quality finished goods at a profit.

Oskar Burger, Plant Layout Engineer of Eclipse Machine Div., Bendix Aviation Corp., stressed this point in opening his detailed analysis of work simplification and plant layout at the October 7 meeting of Elmira Chapter in the Mark Twain Hotel.

Importance of a high-caliber, cost-conscious engineer to head the Methods Department is often overlooked by management, as a key factor in production efficiency, Mr. Burger pointed out.

Equipment, he continued, should be carefully selected by the Process Department, whose decision in selection cannot be retracted without waste and confusion.

Proper choice of tools should be made through a conference of all parties concerned, including the operator who will eventually use the tools, he believes.

Economies in tool design, as in the substitution of a quick clamping arrangement for screw type lock devices in jig and fixture work, result in sizable aggregate savings, Mr. Burger added.

Plant layout, the speaker declared, originally instituted to reduce material handling, is now an important source of information on many and varied subjects. Such a department should be staffed with practical men of diversified knowledge and experience.

Time and motion study should embrace more than rate setting. Suggestions for improvements in methods and layout should also emanate from this department, according to Mr. Burger.

In summary, the speaker urged a better realization on the part of management, of the proper functions of all service departments, to eliminate overlapping and to aid work simplification.

At the conclusion of his talk, the original films of Frank B. Gilbreth were shown. The pictures reflected the infinite patience, ingenuity and common sense of this pioneer in industrial efficiency, to analyze and improve the range of manual skills existent at the turn of the century.

Describe Qualities, Uses Of New High Speed Steels

Toledo, Ohio—Leonard C. Grimshaw, Chief Metallurgist, and Ray P. Kells, Chief Service Engineer of Latrobe Electric Steel Co., collaborated in addressing Toledo Chapter, October 18, at a meeting in the Toledo Yacht Club. Their subject was "Effects of Modern Developments in High Speed Steel."

L. C. Grimshaw

R. P. Kells

Mr. Grimshaw talked on the properties and heat treatment of various types of steel, illustrating his lecture with slides and charts.

His associate, Mr. Kells, answered questions concerning specific applications to actual shop service conditions.

Before the meeting, dinner was served to the 92 members and friends present.

Ladies' Night

Erie, Pa.—Recent function of Erie Chapter was the Annual Ladies' Night held at the Culbertson Hills Country Club.

Following the dinner, accompanied with selections played by the Almhagen Trio, there was a short business session during which Chairman Harold W. Hagle presented John Wilcox with a Past Chairman pin. Mr. Wilcox received the good wishes of the group, for success in his new business undertaking at Philadelphia.

W. J. Gamble, former National Director, spoke briefly before introducing Attorney Edward Carney. Mr. Carney talked on his experiences in the F.B.I. during World War II.

After Mr. Carney's address, entertainment was presented, followed by dancing. More than 70 members and guests attended the affair.

Stresses Citizenship Duties

Toronto, Ont.—'Do not neglect the privileges of your democratic government," said His Worship Robert H. Saunders, C.B.E.K.C., addressing Toronto Chapter members, their sons and daughters, "or your heritage—your freedom—so difficult to obtain, will stand in danger."

An expert on his subject, "Citizenship," the Mayor gave the gathering much food for thought, as guest speaker at the annual Father and Son Night, held October 21 in the Royal York Hotel.

At the beginning of his address, Mayor Saunders conveyed appreciation to the tool engineers for their magnificent part in the war effort, and pointed out to their sons that even the pens used in school were tool engineered.

He expressed particular concern that Canadians neglect to keep informed of the records of governmental representatives. Many citizens, including the Tool Engineers, he stressed, do not know who their representatives are.

Injecting a dash of humor into his speech, he kept his audience amused, as well as keenly interested. Touching on safety, primarily for the benefit of the sons and daughters present, he analyzed the cause and prevention of accidents.

At the conclusion of Mayor Saunders' address, Chairman Walter Appleton presented him with the Chapter's check for $100 as a contribution to the United Welfare Chest whose campaign opened the day of the meeting.

Motion pictures shown by John A. Easton included sports and comedy features.

Pat Tatz, daughter of Member Alfred Tatz, gave a piano recital, and John Crawford, accompanied by his father, Past Chairman R. Eric Crawford, played violin selections.

Represents 2 Companies

Wilbraham, Mass.—Richard S. Brown has been appointed representative for the Ferracute Machine Co. and Superspeed Press Corp. of Bridgeton, N. J., according to a recent announcement.

Mr. Brown will act as agent for the two companies in all of the New England states, except Connecticut. He is a member of Springfield (Mass.) Chapter, ASTE.

Children of Toronto Chapter members were guests at Father and Son Night held October 21 in the Royal York Hotel. Shown above, left to right, are: 1. Bill Appleton, L. M. Jardine, First Vice-Chairman; Audrey Upton, H. C. Upton, Treasurer. 2. T. H. C. Alison, Membership Chairman; Paul Burk, J. B. Burk, Secretary; Bob Farmer, John Lengbridge, Education Chairman. 3. George Elliott, Second Vice-Chairman; J. B. McRae, Fred Schytte and E. N. Wearn, Past Chairmen; Dorothy Greer, E. L. Greer, Acting Program Chairman. 4. Richard Barker, Edgar Barker, Past Chairman; John Crawford, R. E. Crawford, Past Chairman; Robert H. Saunders, Mayor of Toronto and guest speaker; and W. W. Appleton, Chairman

★ ★ ★

A·S·T·E· Productioneers

YOUR CENTRAL OFFICE STAFF

FIRST TO greet visitors at the Central Office and last to say farewell is the charming *Senorita*, Helen Herreria.

In addition to serving as switchboard operator and receptionist, Helen assists the file clerk and helps open the voluminous Society mail.

All orders for membership certificates are referred to her for checking. After

Helen Herreria smiles a welcome to visitors

entering membership data on each order, she writes purchase orders for the engrossing of the certificates. When the completed documents are returned from the printer, she checks them for accuracy.

Whenever time permits, she lends a willing hand in the various departments of the Detroit office.

Helen, who is of direct Spanish descent, is bilingual, speaking the Castilian tongue very fluently. She is Treasurer of La Juventud Espanola, a Spanish youth club, loves to ride horseback and dance.

Her great ambition, to be a bride, will be realized next spring when she and her Cuban fiance take the big step, followed by a trip to the Pearl of the Antilles.

Helen has always lived in Detroit; attended Western High School, and was employed in the offices of Cushman Motor Delivery and Turchan Follower Machine Co. before coming to ASTE.

One of the best informed members of the ASTE staff, concerning Society activities, is Carol Morell, who sees every incoming and outgoing piece of correspondence.

Miss Morell opens the mail, time stamps and distributes it. As she gives out the incoming correspondence, she collects from each department finished business of the previous day, for filing.

After sorting the assembled letters with attached replies, copies of officer correspondence, dues notices, orders for Society emblems, data sheets, binders and membership certificates; address change notifications, invoices, membership applications, Chapter meeting announcements, minutes and requests for Society office supplies; committee reports, travel expense accounts, undeliverable membership mail, armed service notifications and reinstatements, deceased removal and Chapter transfer forms, Carol files them carefully in the proper folders, making new ones when necessary.

Keeps "Tickler" File

It is also her responsibility to locate file material upon request. As another service to the staff, she maintains a "tickler" file. This she checks each day, reminding the personnel of unfinished business to be followed up.

Then she reverses the mail delivery procedure, collecting the outgoing communications written in the several departments.

Carol joined the ASTE staff a year ago, after several years' association with Detroit Steel Products Co., where she served in various capacities as receptionist, mail and messenger girl and secretary to the plant superintendent.

For the rugged reaching and bending acrobatics of filing, she keeps in trim by bowling. She is a graduate of Mackenzie High School in her native Detroit.

* *

In the receiving and shipping department, assembly line methods are employed to process the bulky material handled.

Here the staff works as a team, without specific, individual duties. Expanded Society activities have greatly increased the load on this department which sometimes requires the services of six or eight men, for spot jobs. Peak loads are common, especially in connection with conventions and special programs initiated within the organization.

Analysis discloses that daily mail output has increased from 434 pieces to 631 pieces during the past year, exclusive of *Tool Engineer* and Directory

Carol Morell keeps the 18,000 ASTE members in their places — in the Central Office files

mailings which are handled outside of Central Office.

In this annual processing of more than a quarter-million communications and packages, each piece of letter mail must be run through the postage metering machine which automatically seals the envelope.

Parcel post shipments are packed, wrapped and affixed with address and postage labels. Then the material is sorted by zones, states and cities, entered in the meter machine records and delivered to the postoffice.

Handles 2,000,000 Data Sheets

A major operation in this division is the dissemination of ASTE data sheets. The department is set up to handle two million sheets and collate sets comprising engineering information from as many as 88 suppliers.

Staggered collating bins reduce time required for assembling and conserve the energy of the operator. Despite such laborsaving devices, the average estimated time for completing a two-company mailing of data sheets to the entire membership is approximately 225 man-hours.

Mimeographing is another important function of this department which is continually processing letters, post cards, announcements, reports, minutes, bulletins, office and committee forms. Frequently these, too, must be collated, stapled and folded before inserting in the envelopes.

The mail room crew also opens and checks incoming shipments and performs many little services for the comfort and efficiency of the entire Central Office personnel, in the adjustment, repair and moving of office equipment.

Supervising this beehive of activity is Truman Nelson who also purchases sup-

In this view of the ASTE production line, Truman Nelson (left) records mailing data for processed and zoned packages of ASTE data sheets; Dan Popiolek turns out some mimeographed meeting minutes; Tony Madonia (at collating bins) inserts a set of data sheets in envelope; and John Reilly affixes metered postage to a new member's Code of Ethics. Graphs on wall chart work schedules and status of specific jobs

plies, analyzes mailing costs and charts work schedules.

A Manhattanite by birth, Mr. Nelson is a graduate of St. John's Academy in New Hampshire, and the University of Michigan where he was engaged in research before joining the ASTE staff a year and a half ago. A profound thinker, Truman collects books, enjoys tennis and golf, and goes on occasional fishing and hunting trips.

His two assistants are Anthony Madonia and Daniel Popiolek. Born in Springfield, Ill., and educated in the Detroit schools, Tony likes music, football, basketball, horseback riding—and work.

Dan, who first saw the light of day in the nearby city of Toledo, Ohio, graduated from high school in Detroit's Hamtramck. During the war he was a tool crib leader at Packard Motor Car Co. Outside the office, his interests include dancing, bowling and swimming.

During rush periods John Reilly, a student at Detroit Institute of Technology, comes to the assistance of the mail room staff. A native of Canada, John served with the U. S. Coast Guard as a Yeoman 1/C. While debating is his pet hobby, he is a follower of Izaak Walton, and likes to hunt.

Former Apprentices Fete Codd With Testimonial

Rochester, N. Y.—Recognition of his nearly half a century of passing the "know-how" on to others came to Charles E. Codd, when 40 of his former apprentices recently tendered the 72-year-old Master Mechanic at Ritter Co., Inc., a testimonial dinner at the J and L Restaurant.

C. E. Codd

A veteran with his company since 1900, Mr. Codd instituted the first apprenticeship training in Rochester. The four-year course he inaugurated includes three years in general training on lathes, milling machines, drill presses, bench work and production of tools from drawings. Specialization is emphasized in the final year. Most of his trainees supplement their shop work with night school study.

Many-Sided Personality

The pioneer apprentice instructor, reports *The Irondequoit Press* of Rochester, "has as complex a personality as some of the highly intricate machines he has produced. He spouts poetry to illustrate a point. When tension runs high, he sings softly to himself. Bowling and golf are his pet participant sports. In addition, he's a pigeon fancier and horticulturist."

Mr. Codd was born at Lincoln City, England, once a Roman army camping ground. Fifty years ago he made a 4000-mile bicycle tour of England, Scotland and Wales.

Guests at the affair included Edward J. Reis, President of the Ritter Co. A bowling party followed the banquet.

A Past Chairman of Rochester Chapter, ASTE, Mr. Codd is a member of the present Chapter Executive Board and serves as Chapter Historian.

Salt Baths Used in All Thermal Metal Processing

Philadelphia, Pa. — Salt bath heat treating was authoritatively discussed by Harold J. Babcock, Director of Research, Ajax Electric Co., Inc., speaking before more than 200 members of Philadelphia Chapter at a dinner meeting in the Engineers Club, October 17.

Threefold advantages of the salt bath, as enumerated in Mr. Babcock's lecture, "Engineering the Tools of the Heat Treater," are: 1. Assures absolute uniformity of temperature, since the metal in intimate contact with the surrounding molten salt receives heat only by conduction. 2. Totally eliminates all atmosphere with its accompanying problems of scale and pitting. 3. Uses a heating medium of high thermal capacity, making it possible to heat work in five minutes against the 20-30 minutes required for hearth type heating.

Present salt bath pots, the speaker continued, are heated by the immersion of all electrodes on one side of the bath. Each pair of electrodes is spaced only 1/3″ apart and operates at 8-18 volts. A high current of 1000-4000 amperes flows between each pair. Spacing and current flow are designed to produce a "motor-effect," mechanically propelling the molten salt downward within the gap between each electrode pair.

Temperature deviations of the salt bath, no greater than 5°F., are common in tanks 30 feet or more in length, he added.

Boiler Plate Steel Pots

Welded pots made of ordinary boiler plate steel are adequate, Mr. Babcock stated, for salt baths up to 1100°F., composed of nitrates, and also for cyanide or activated cyanide salts up to 1750°F. This construction has shown remarkable endurance in nitrate type baths where no pots or electrodes have been replaced even after operating periods exceeding seven years. In the case of cyanide, life span of the pot averages from nine to more than 18 months.

For temperature ranges around 2360° F., a special refractory material chemically compatible with neutral salt bath work has been developed. Specially formed tile is used with lock joint construction. Pot life extends to 18 months or more when used at this temperature, the speaker said.

Mystery no longer surrounds the composition of suitable salt mixtures for use in heat treating. Today, manufacturers of heat treating salts have available well standardized brands of salt mixtures, each adapted to a specific temperature range, according to Mr. Babcock.

Other procedures described included: Heat treatment of aluminum alloys; brazing of aluminum assemblies and of joints between ferrous and non-ferrous assemblies formed with copper, silver or brass solders.

After annealing, the speaker pointed out, stainless or alloy steel coiled rod can be readily cleaned with considerable saving in virgin metal and time, by using a sodium hydride bath rather than prolonged pickling. The same process can also be employed for cleaning castings where absolute assurance of clean interior surfaces is necessary.

Treatment of Finished Surfaces

Sodium cyanide baths were recommended as the ideal heat treating medium for hardening finished machine surfaces, because they not only prevent decarburization, but also produce a file-hard wearing surface.

Salt baths, Mr. Babcock summarized, are found in use for every operation in the thermal processing of metals.

Prior to the technical session, Leonard Subber, Standards Chairman, reported on the work of his Committee, outlining a program for membership participation.

A questionnaire concerning the standardization of various designs, dimensions and information applicable to jig and fixture parts, such as hand knobs and wing nuts, was discussed. Further activity in tooling standardization is to be introduced at subsequent meetings.

Recorded music was played during dinner, and two outdoor films, "Ride 'Em Cowboy," and "Trout Fishing in Glacier National Park," were shown.

Shows Modern Gearing

Columbus, Ohio—Henry G. Stone of The Fellows Gear Shaper Co., Springfield, Vt., described "Features of Gear Engineering," for 72 members of Columbus Chapter at a meeting October 9 in the Fort Hayes Hotel.

Mr. Stone showed three reels of motion pictures—one narrating the development of gears from the very oldest wooden model to the modern cut gear, the others depicting various types of gears, equipment and new gear finishing machinery.

Harold J. Babcock (left), Director of Research for Ajax Electric Co., Inc., tells Philadelphia Chapter of the advantages of salt baths in heat treating. More than 200 tool engineers heard Mr. Babcock's lecture at their dinner meeting October 17 in the Engineers Club

Dayton Chapter members were dinner guests of Monarch Machine Tool Co., Sidney, Ohio, October 14, before making a tour of the plant. Below: A milling machine operation commands the attention of part of the group of 225 visitors

Liquid Abrasive Honing Said to Extend Tool Life

Minneapolis, Minn.—W. C. Houston, Field Engineer for Vapor Blast Manufacturing Co., Milwaukee, Wis., was the principal speaker at the technical session following the dinner and business meeting held October 2 by Twin Cities Chapter at the Covered Wagon Cafe.

As an introduction to his subject, "Vapor Blast Liquid Honing," Mr. Houston stated that early experimental machines, first built about eight years ago, were designed for cleaning structural plate.

It was A. H. Eppler, President of Vapor Blast Co., who felt that the use of water and chemicals, in combination with an abrasive, made possible a broader application of the vapor blast principle, and that this method could be used in preparing parts for anodyzing, plating, deburring, polishing and surface honing.

Succeeds with Powdered Rock

After testing various materials, including cereals and rice husks, Mr. Eppler finally hit upon the use of decomposed siliceous rock, available in powders and flours ranging in fineness from 80 to 2,500 mesh.

In order to handle these fine abrasives and at the same time increase the tip velocity, they are mixed with a chemical emulsion and discharged at the rate of 3200 feet tip velocity per second, or about 10 to 15 lbs. of material per minute.

Increased tool life, Mr. Houston stated, results from liquid abrasive honing. To substantiate this statement, the speaker cited the case of a very large broach which was deburred and honed in seven hours, whereas previous methods had taken several hundred hours.

Mr. Eppler also addressed the group, pointing out other pertinent facts, especially the more recent development of finishing plastics molds prior to final hand polishing. This last, tedious and most expensive operation can in most cases be omitted, except where high luster is essential, he indicated.

Chairman John Harrington conducted a short business meeting and introduced a group of visitors.

Properties and Processing Of Magnesium Described

Boston, Mass. — Edward S. Bunn, Metallurgical Manager, Magnesium-Aluminum Div., Revere Copper & Brass, Inc., Baltimore, Md., and A. M. Lennie, Sales Engineer, Magnesium Div., Dow Chemical Co., Midland, Mich., participated in a Magnesium symposium presented by Boston Chapter, October 10, at Schrafft's Restaurant.

E. S. Bunn

Mr. Bunn reviewed current methods for the manufacture of sheet and extruded products. Mechanical properties, fabricating characteristics, such as forming, drawing, welding and machining, and corrosion resistance of the commercial alloys were discussed.

Proper protective treatments for decorative and corrosion-resistant applications were considered by the speaker, along with factors which influence design for magnesium alloys, and typical uses.

Describes Machining, Tooling

Mr. Lennie's paper compared the machining of magnesium with other metals, and outlined proper feeds, speeds, and depth of cut for various machining operations, as well as correct tooling.

Use of lubricant fixtures and handling methods were described, and proper machine technique to take full advantage of magnesium alloy, emphasized.

A motion picture, "The Working of Magnesium," illustrated these techniques and the forming, welding, riveting and finishing of magnesium.

The screening of another film, "Planning and Laying Out Work," and a gadget talk by Floyd Dodge, Chief Designing Engineer, Wade Tool Co., Waltham, completed the technical program. Mr. Dodge explained "A Simple Device for Checking Surface Finish on Finely Ground Surfaces."

Plant Operations Shown In Monarch Tour

Dayton, Ohio — Members of Dayton Chapter were guests of Monarch Machine Tool Co. for dinner and a tour of the plant at Sidney, Ohio, October 14.

Following dinner in the company cafeteria, the party was conducted through the plant and observed production operations. One of the highlights was the induction hardening of Acme thread screws prior to thread grinding.

After visiting the plant proper, the group was escorted to a demonstration room where a number of standard and special machines had been set up to perform various functions. In another room, a motion picture showed in detail some of the more involved operations.

Approximately 225 members and guests participated in the evening inspection tour arranged through the invitation of Fred C. Dull, Vice-President and Secretary of the Monarch Co. and a Chapter member.

Correct Tool Design Can Promote Safety

St. Catharines, Ont.—"Tool engineers can perform a vital role in safety and accident prevention, by the proper design of tools and fixtures," Richard E. Frederick, Sr., Safety Engineer for International Business Machines Corp., Endicott, N. Y., told members of Niagara District Chapter during their opening meeting, October 18, at Rose Villa in Welland.

Mr. Frederick claimed that many infectious scratches, cuts and bruises could be avoided by replacing awkward clamping devices, such as thumb screws, wing nuts and star wheels, with simple cam clamps and bayonet locks.

Carbide tools, the speaker said, reduce accident frequency through longer life and fewer setups, although these advantages are somewhat offset by the danger present in higher operating speeds.

According to Mr. Frederick, safety of punch press operations is determined almost solely by the die design. Safety measures include gravity feed loading and automatic stock loaders to eliminate placing the hands beneath the die to load or eject.

Motion pictures of actual punch press operations were shown to illustrate these points.

Columbia Promotes Miller To District Manager

Cleveland, Ohio—Richard W. Miller, formerly Assistant District Manager for the Columbia Tool Steel Co., has been named District Manager of the firm's Chicago office.

R. W. Miller

Mr. Miller has been in the Cleveland office and warehouse for 17 years, serving as office manager and salesman before his appointment to the assistant district managership two years ago.

A former Treasurer and Reception Chairman of Cleveland Chapter, ASTE, Mr. Miller headed the Reception Committee for the Society's Annual Meeting and New Era Exposition at Cleveland last April.

Federal Control Must End

Providence, R. I.—Government management of production, effective during the war only because all efforts were directed toward a single objective, will not succeed now, Ralph E. Flanders, Chairman of the Board of Jones & Lamson Machine Co., Springfield, Vt., and U. S. Senator-Elect from Vermont, told more than 100 members and executives attending the second Annual Executives Night of Little Rhody Chapter, October 16, at the Narragansett Hotel.

Mr. Flanders, a member of Twin States Chapter, ASTE, talked on "Tool Design and Standard of Living." Tracing the development of tool engineering from earliest days of rifle manufacture to the present, he emphasized the imtortant work ahead in producing goods to continue our present scale of living.

John S. Higgins, President of Whittet-Higgins Co., in an earlier address on the Rhode Island industrial situation, said a survey of his own showed every industrial plant in the State "handicapped somewhere." All have backlogs of orders, but are hampered by material and manpower shortages. Mr. Higgins was one of the founders and a charter member of the Chapter.

Robert B. Parker, Second Vice-Chairman, was Toastmaster, and Arnold C. White, Chairman, extended a warm welcome to the gathering.

Others at the speakers' table were Second Vice-President I. F. Holland; Past Presidents Ray H. Morris of Hartford and Frank W. Curtis of Springfield, Mass.; and Frederick S. Blackall, Past President of the New England Council.

Keusch Shows Techniques In Plastics Diemaking

Baltimore, Md.—Problems encountered in producing molding dies for plastics and methods employed in solving them, were very clearly explained to Baltimore Chapter members, by Edward Keusch, Tool Engineer of Boonton Molding Co., Boonton, N. J., in a talk on "Plastics," October 2 in the Engineers Club.

Mr. Keusch's address was accompanied by a film, "The Shape of Things to Come," showing the manufacture of plastics parts in the Boonton shops.

David Murray, of the Boonton Co., displayed samples of many of the molded parts pictured in process of manufacture in the motion picture.

Precision Measuring Shown in Slides

Syracuse, N. Y. — Technical subject for the October 15 meeting of Syracuse Chapter was "Precision Measurement in the Metal Working Industry."

Speaker of the evening was Earl C. Rocusek of the DoAll Rochester Co., who supplemented his talk with a slide lecture.

William Driscoll, Vice-President of the Carrier Corp., also spoke briefly before the technical program.

Raymond Coseo, Chairman, presided at the dinner meeting attended by approximately 65 engineers.

Thomas Returns to J & M

Mishawaka, Ind.—After an illness of a year at his home in Detroit, U. G. Thomas has resumed his position as Plant Manager of the J & M Mfg. Co., 2703 Lincolnway West, Mishawaka.

Mr. Thomas is an ASTE member, affiliated with Detroit Chapter.

Sapphire Gages Combine Strength with Wear Resistance

Los Angeles, Calif. — Advantages of sapphire gages and the manufacture and processing of the synthetic jewels, were thoroughly explained to Los Angeles Chapter members at their meeting October 10.

With the aid of an excellent color-sound motion picture, and slides, Howard F. Lewis, Western Sales Manager, Elgin National Watch Co., presented his subject, "Elgin Sapphire Products."

The raw material, alumina, Mr. Lewis began, is fused in an electric furnace to a so-called "boule," a torpedo-shaped piece of sapphire approximately ½" diameter x 3" long. First steps in the manufacture of watch jewels are splitting the boule lengthwise and mounting the two halves on little blocks, by means of sealing wax.

The severed boule is then further divided into many half-moon slices, in a milling machine. Cutting tools are thin copper discs charged with diamond dust.

After this operation, the sapphire segments are mounted with shellac on steel blocks and Blanchard ground. In the next milling machine operation, they are cut into small squares, each of which is now a blank for a watch jewel.

Ground to Size

The squares are centerless-ground into round discs, the center holes spotted and drilled, and lapped to size with a diamond-charged wire of varying diameter. After the holes have been finished to an olive shape, the jewels are finally ground to their ultimate external dimensions.

Following careful inspection under powerful microscopes, the synthetic sapphires are ready to be mounted in the movements of watches, chronometers, indicators and other delicate instruments.

Mr. Lewis quoted the Elgin National Watch Co., as employing, in its synthetic sapphire division, one tool maker for every six employees, completely mechanizing what the Swiss are doing by hand.

Cost of a manufactured jewel at 35c, against 5c for an imported stone, caused the abandonment of synthetic production at the conclusion of World War I. To keep the industry intact, it was necessary to open new fields for the use of manufactured sapphires.

Since the mono-crystalline material has extreme abrasion resistance, great mechanical strength and toughness, it is ideally suited for plug gages, and wear-points in precision measuring instruments. If accidentally chipped in use, sapphire does not throw up a burr, as gages made of other materials frequently do, the speaker pointed out.

While their cost is comparatively high, sapphire gages wear so little that no wear allowance is made in the size of plugs—in fact, they are represented as "gages that do not wear," with claimed economies over other types of inspection tools.

At the conclusion of the lecture, the audience participated in a stimulating open discussion.

Describes Auto Spring Systems

Before the technical session, Edgar Brooker, Chief Metallurgist of United States Spring and Bumper Co., discussed "Automotive Leaf Springs." He related factors involved in the design of automobile spring systems.

Leaf springs, he stated, are ideal for smooth riding vehicles, since they absorb road shock rapidly, but, because of interleaf friction, dissipate slowly the energy absorbed.

When asked why so many cars were equipped with coil springs, he explained that these springs were developed in Europe, where cobblestone pavements are common, and were offered to the American public as a great technical improvement and selling point.

To Manage Sales

Cleveland, Ohio—George H. Kaiser has assumed the position of District Sales Manager in charge at Cleveland, according to an announcement by Columbia Tool Steel Co.

Mr. Kaiser, a member of Chicago Chapter, ASTE, joined the Columbia sales staff in 1930. Since 1942 he has been Sales Manager in Chicago, and will now have full charge of the sales office, sales department and warehouse operation located at 1640 St. Clair Ave., Cleveland.

Among Syracuse Chapter officers who welcomed Earl Rocusek of the DoAll Rochester Co., speaker at the October 15 meeting, were (left to right): L. H. Collins, 2nd V. Chm.; Hugo C. Klix, 1st V. Chm.; Albert Vesper, Treas.; and Raymond D. Coseo, Chm. Right: Mr. Rocusek shows optical flat for precision measurement

★ ★ ★

Coming MEETINGS

ALL CHAPTERS — January. Election of Nominating Committee. Consideration of nominees for National Directors.

BOSTON— January 9, Schrafft's Restaurant. Speaker: H. S. Indge, Lapping Dev. Eng., Norton Co., Worcester, Mass. and L. M. Nielsen, Industrial Eng., General Electric Co., River Works, Lynn, Mass. Subjects: "Lapping Machine Practice and Surface Finish" and "Specifications and Interpretation of Surface Finishes." Sound film, "Refractory Metals," Fansteel Metallurgical Corp.

CEDAR RAPIDS—December 18, Annual Christmas Party, Montrose Hotel. Dinner 6:30 P.M., Program 8:00 P.M., Dancing. Jan. 15, Speaker: Clare Bryan, Consulting Eng., Link-Belt Co., Chicago, Ill. Subject: "Practical Engineering of Jigs and Fixtures."

CENTRAL PENNA.—January 14. Time and place to be announced. Speaker: H. E. Conrad, Executive Secy., ASTE. Subject: "Objectives of ASTE and General Chapter Activities."

CHICAGO—January 6, Graemere Hotel. Speaker: "Prof." Russell E. Oakes, the "Wacky Wizard of Waukesha," in a demonstration of "goofy" gadgets. Entertainment.

CINCINNATI— January 14, 6:30 P.M., Engineering Society. Speaker: R. E. Frederick, International Business Machines Corp., Endicott, N. Y. Subject: "Tool Engineering for Safety."

CLEVELAND—December 14, Christmas Party, Hotel Carter. January 10, Allerton Hotel. Speaker: Wendell Whipp, Pres., Monarch Machine Tool Co., Sidney, Ohio. Subject: "Latest Developments in Machine Tools."

DAYTON—January 13, Plant Visitation to National Supply Co., Springfield, Ohio. Dinner, 6:30 P.M.

DECATUR—January, Ladies' Night.

ELMIRA—January 6, 7:00 P.M. Mark Twain Hotel. Speaker to be announced. Subject: "Metals and Heat Treating."

ERIE—January 7. Speaker: A. H. d'Arcambal, Vice-Pres.-Consulting Met., Pratt & Whitney, Div. Niles-Bement-Pond Co., W. Hartford, Conn.

FLINT—January 16. Subject: "Broach Design and Practical Production Broaching."

HAMILTON—December 13, Royal Hotel, Guelph, Ont. Speaker: Don Thorburn, Gen. Mgr., Brantford Engineering & Equipment Co., Brantford, Ont. Subject: "Fundamentals Governing Selection of Furnaces and Fuel." January 10, Fischer's Hotel, Hamilton. Speaker: A. W. Meyer, Asst. Director of Design, Brown & Sharpe Mfg. Co., Providence, R. I. Subject to be announced.

HOUSTON—March 19-22, Annual Meeting, ASTE.

LITTLE RHODY—December 18, Christmas Party and Fun Nite, Oates Tavern. January 15. Speaker: L. R. Twyman, Mgr., Industrial Div., Vickers, Inc., Detroit, Mich. Subject: "Hydraulics."

LOUISVILLE—January 14. Speaker: J. A. Koch, Carpenter Steel Co., Reading, Pa. Subject: "Design and Proper Application of Steel."

MILWAUKEE—January, Annual Dinner Dance.

MUNCIE—January 8, 6:30 P.M., YMCA. Speaker: R. R. Rhodehamel, Gen. Sales Mgr., National Acme Co., Cleveland, Ohio. Subject: "Tooling Multiple Spindle Bar and Chucking Machines."

PHILADELPHIA—December 19, Christmas Party. January 16, Carbide Symposium. Speakers to be announced.

PITTSBURGH — December 20, Annual Christmas Party. January 3, 6:30 P.M. Fort Pitt Hotel. Speaker: A. B. Einig, Gen. Mgr., Motch & Merryweather Machy. Co., Cleveland, Ohio. Subject: "A Glimpse of the Orient," illustrated with films.

ROCHESTER — January 15, 8:00 P.M., Rochester Institute of Technology. Speaker: R. R. Rhodehamel, Gen. Sales Mgr., National Acme Co., Cleveland, Ohio. Subject: "Tooling Multiple Spindle Automatic Bar and Chucking Machines for Higher Production."

SYRACUSE—January 14, 8:00 P.M., Onondaga Hotel. Speakers and subjects: R. P. Esser, "Industrial Hydraulics"; Lester Speickhoff, "The Mosley Floating Die Holder."

TOLEDO—January 8, 7:00 P.M., Toledo Yacht Club. Speaker: G. H. McGreevy, Vice-Pres. in Charge of Sales, Textileather Corp., Toledo, Ohio. Subject: "Importance of Coated Fabrics in Industry."

TORONTO—January 13. Speaker: A. W. Meyer, Asst. Director of Design, Brown & Sharpe Mfg. Co., Providence, R. I. Subject: "Trends in Machine and Tool Design."

More than 120 members and guests of Flint Chapter attended recent dinner meeting and technical session at Fischer's Hotel, Frankenmuth, Mich., when George E. Brumbach, of Carpenter Steel Co., lectured on Tool Steels. Mr. Brumbach is seated at center of the speakers' table (against wall). Officers at the table are: Arthur Close, Membership Chairman; J. A. Koeppen, Secretary; H. T. Pierpont, Jr., Second Vice-Chairman; Robert Stoltz, Technical Chairman; L. A. Kitchen, Chairman; and Gerald Eggleston, Treasurer

Smila Appoints Bellamy Data Sheet Chairman

Detroit, Mich.—W. H. Smila, ASTE National Standards Chairman and recently appointed member of the ASME Advisory Committee for Metal Cutting Data, has announced the appointment of L. B. Bellamy, District Manager of the Sterling Grinding Wheel Co., Detroit, as Chairman of the ASTE Data Sheet Sub-Committee.

W. H. Smila

A member of this Committee since its inception in September of 1945, Mr. Bellamy succeeds Grant S. Wilcox, Jr., Assistant Master Mechanic, Plymouth Div., Chrysler Corp., Detroit.

Mr. Wilcox, who organized and directed the Committee through its first year of activity, requested that he be relieved of the chairmanship in order to devote more time to his responsibilities as a National Director of the Society and as Chairman of the Affiliate Council of the Engineering Societies of Detroit. He remains a member of both the National Standards Committee and the Data Sheet Sub-Committee.

Mr. Smila's appointment to the ASME Advisory Committee for Metal Cutting Data is expected to further correlate activities of the two societies. In his long service with the automotive industry, Mr. Smila has been successful in coping with the many problems of production tooling, including metal cutting. He is associated with Plymouth Div. of Chrysler Corp. as Master Mechanic.

Poor Tool Design Blamed For Heat Treat Breakage

Flint, Mich.—Design of the tool itself is the major cause of tool breakage in heat treating, George E. Brumbach, Metallurgical Engineer for Carpenter Steel Co., Reading, Pa., told Flint Chapter members in a recent dinner meeting at Fischer's Hotel, Frankenmuth.

Mr. Brumbach, in his talk, "Tool Steels and Their Application," went on to explain how various-sized sections in the same piece set up stresses and strains in hardening, sufficient to crack the tool. Slight changes in design, he pointed out, will usually assure a more uniform section.

The speaker illustrated with slides good and poor steels, as well as results of defective heat treatment, presenting solutions to the problems described.

Robert Stoltz, Technical Chairman, conducted the ensuing discussion period.

A film, "Robots at Work," showed uses of plastics and methods employed in manufacturing parts. The production was sponsored by Stokes Machine Co.

Before the technical session, a Past Chairman pin was presented to Michael Skunda, Immediate Past Chairman. More than 120 members and guests attended the meeting.

Product Dreams Realized Through Metal Spinning

New Haven, Conn. — Metal spinning not only combines speed of production with relatively low tool cost, for sheet metal shapes generated by rotation, but it also provides designers with a versatile process for streamline, modern forms with simple flowing contours, New Haven Chapter members learned at a meeting October 10 in the Connecticut Light and Power Auditorium, Waterbury.

Speaker at the technical meeting was Henry Russell Adams, Vice-President and Treasurer of William Bergfels & Co., Newark, N. J., who lectured on "Spinning of Stainless Steel." Mr. Adams described the metal spinning process from blank to finished part, including machines and equipment used.

Both experimental and production parts can be economically produced by spinning, the speaker stressed. Flexibility of the process permits form changing and facilitates development of new models without the delay of complicated die casting.

Hardened During Spinning

During the spinning, he continued, the metal is work-hardened, the cycles of spinning and annealing being arranged to give the desired physical properties in the finished part. Diameter limitations of aluminum, copper, monel and stainless steel parts were given.

Parts up to 72" diameter and .140" thickness are possible in the latter metal, the group was told.

In some instances, savings can be effected through building assemblies by brazing or welding simple parts, Mr. Adams added. Spinning over after assembly frequently improves the appearance and mechanical strength of the product, as well as maintaining closer tolerances than are possible by other methods of finishing round assemblies, he concluded.

Mr. Adams used blackboard sketches, sample parts, metal spinning tools and motion pictures to illustrate his address before the approximately 40 Chapter members.

Witham, Carbide Engineer For Johnson-deVou

Boston, Mass.—C. Raymond Witham, formerly of the Methods Department at the West Lynn, Div. of General Electric Co., has joined Johnson-de Vou, Inc., of Boston and Worcester, as Carbide Specialist.

C. R. Witham

For the past year, Mr. Witham has been in charge of converting to carbide on all possible cutting tool applications, at the West Lynn General Electric plant. He also instructed the personnel in design, application and maintenance of carbide cutting tools.

From 1942 until his transfer to West Lynn, he was in charge of design and application of carbide cutting tools at the G. E. Supercharger Plant in Everett.

In his new connection, Mr. Witham, who is a member of Boston Chapter, ASTE, will travel through Massachusetts, Maine, New Hampshire and Vermont.

R. E. Esch, of Vickers, Inc., uses slide to explain fine point in hydraulics to E. A. Gunthner, Technical Chm. for October 1 meeting of Peoria Chapter. A. M. Lane, Vickers' District Rep., holds box of slides while A. E. Rylander (right) of *The Tool Engineer* looks on. Mr. Esch was main speaker of the evening

Jones Asks Industry To Apply Discoveries

Milwaukee, Wis. — Dr. Hilton Ira Jones, Managing Director for Hizone Research Laboratories, Wilmette, Ill., gave his lecture, "Peeps at Things to Come," before a dinner meeting of Milwaukee Chapter, October 10, in the Elks Club.

H. I. Jones

Dr. Jones explained in detail many new but unpublicized scientific developments whose applications would obsolete present manufactured products.

Tool designers, engineers and manufacturers, Dr. Jones emphasized, should work more closely with science so that new discoveries may be translated more quickly into superior goods for better living.

A distinguished chemist and lecturer, Dr. Jones interpreted his scientific subject in a simple and dramatic manner, giving platform demonstrations of the amazing developments promised for the future.

Prior to Dr. Jones' address, Chairman Richard Ford gave a brief summary of the fall regional meeting in Chicago.

Psychology Pays Off

Detroit, Mich.—Dr. Donald A. Laird, noted psychologist and lecturer, was the principal speaker at a meeting of Detroit Chapter, October 10, in the Engineering Society of Detroit headquarters. Dr. Laird's subject was "The Technique of Building Leadership."

In a humorous and practical manner, he stressed the importance of a constructive attitude towards one's associates, suggesting ways of securing the good will and cooperation of employees and fellow workers.

Eugene Bouton of Racine, a former ASTE Director, also spoke briefly. Seven visitors from India, who are observing production methods at Ford Motor Co. and Chrysler Corp., were introduced to the members.

The entire gathering of approximately 200 members and guests joined in a song fest immediately after the dinner which preceded the program.

Relates New Trends In Hydraulics

Peoria, Ill.—Opening his address with the declaration, "I am not going to discuss the history or manufacture of hydraulics," Rudolph E. Esch, Manager, Machinery Equipment Dept., Vickers, Inc., Detroit, told Peoria Tool Engineers of developments and trends in the hydraulics field during the past year.

In his lecture, "New Developments in Transmission of Power," given at a meeting October 1 in the Jefferson Hotel, Mr. Esch discussed control of leaks, compactness of design, and the availability of the newest items in hydraulics. He was assisted by A. M. Lane, local Vickers representative.

The speaker illustrated his talk with a Navy training film showing hydraulic power transmission applied to the 45mm anti-aircraft gun.

Coffee speaker was A. E. Rylander, Technical Editor of *The Tool Engineer*, who gave one of his inimitable verbal "Andygrams."

Edward Gunthner, Supervisor of Machine Repair at Caterpillar Tractor Co., was Technical Chairman for the meeting.

Induction Heating Profitable Operation

Evansville, Ind. — Elimination of skilled labor and use of inexpensive materials, in many cases, makes induction heating profitable in production operations of all types, according to K. A. Dean of the Lepel High Frequency Laboratories, Inc., New York City.

Mr. Dean was the technical speaker at a meeting of Evansville Chapter in the McCurdy Hotel, October 14.

The speaker made sketches of proper methods, uses of coils, and the parts these techniques play in everyday production.

Mr. Dean also answered questions from the floor concerning tube soldering, external and internal hardening of cylinder sleeves, gears, tubes and shafts.

Membership Chairman Roy Ackerman announced the election of five new members: W. Jared, Asst. to Vice-Pres. in Charge of Mfg., Servel, Inc.; E. R. Goforth, J. V. Whittaker, A. J. O'Connel and J. R. Brill of the Planning Engineering Dept., International Harvester Co.

Builders of A. S. T. E.

Frank W. Curtis, President, 1941-1942

By O. B. JONES, *Society Historian*

WITH THE tooling for the World War II armament program, came a great upsurge of Society membership. This was during the 1941-42 administration of Frank W. Curtis, then Chief Engineer of the Van Norman Machine Tool Co., Springfield, Mass., and now manufacturing consultant specializing in high frequency heating, both induction and dielectric.

O. B. Jones

A few months after taking office, Frank assumed a heavy mantle of responsibility when Ford R. Lamb, the Executive Secretary, fell ill and subsequently passed away.

In the interim before the appointment of a successor the following March, the National Officers carried on, and directed the operations at National Headquarters. Assisting Frank were Otto W. Winter, First Vice-President; Ray H. Morris, Second Vice-President; Frank R. Crone, National Treasurer; and Clyde L. Hause, National Secretary.

Wrote Engineering Texts

Frank's enthusiasm for the profession of tool engineering had made him a "natural" for Society membership in the early days of the organization. Long before this time, he had co-authored three tool engineering textbooks; even planned a tool engineer's handbook which he had to abandon because it assumed proportions too great for a one-man project.

As Co-Chairman of the Handbook Committee, he is now directing these efforts toward the publication of the Society's engineering manual. He has also written several books on induction heating.

Another of Frank's "firsts" was the institution of "Executives Night" meetings, now so popular in many Chapters. Inspiration for this innovation was a conversation with John Lindegren of Worcester, who remarked, "I doubt if the executives of my company know about ASTE and the fine work it is doing."

Founded 'Executives Night'

"That gives me an idea," exclaimed Frank, "let's have an 'Executives Night,' ask some of the invited industrialists to make brief remarks, and top it off with a big speaker all the executives and members would enjoy hearing!"

So the first such function took place in December of 1940 at Springfield (Mass.) Chapter during Frank's term as Chairman.

John H. Van Deventer, then President and Editor of *The Iron Age*, and a much sought-after Chapter speaker, gave the principal address. Leading local industrialists and A. H. d'Arcambal, then ASTE President, also spoke.

Such an event could not fail of success in the hands of Frank, the great crusader for better Chapter programs.

With this background of achievement, no one but Frank was surprised when he was chosen to lead the Society the following year. As he says:

"Although I had been active in ASTE for a number of years, my election to the presidency came out of a clear sky, so to speak."

A Board member for several terms, he had taken part in the organization of both Pittsburgh and Springfield Chapters, serving as first Chairman in the latter group and on various National Committees. So he was not unaccustomed to ASTE work, it was just a case of—more work.

Employer Gave 'Carte Blanche'

"Thanks to a wonderful boss at that time, James Y. Scott, President of Van Norman Co., who said, 'Take all the time you feel is necessary,' I had the pleasure of meeting a great many members around the country and of doing things I had always wanted to do," says Past President Curtis.

As in any organization, the President is asked to visit "here and there." Before he knew it, he had a schedule of Chapter visits lined up that really kept him moving. In all he visited more than 40 Chapters.

What impressed him most about these visits was the spirit with which Chapter meetings were conducted, and the urge to benefit both technically and socially —a real ASTE achievement.

"During the year," he recalls, "13 Chapters were chartered, and the membership increased from less than 7,000 to more than 10,000—thanks to all the boys who were out there pitching.

"While I was unable to be present at all of the charter meetings, I did have the pleasure of attending seven—Nashville, San Diego, Potomac, North Texas, Wichita, Little Rhody and Louisville. When you're called upon to charter a Chapter, it gives you a paternal feeling, and you want to return to see how things are going.

F. W. Curtis

"The biggest charter meeting was at San Diego where well over 150 members joined the Society. It was necessary to hold two sessions—one at noon and the other in the evening—because many of the boys were working nights.

"Somehow, as good tool engineers, we worked out a system for election of Chapter officers, carrying over the noon results to the evening meeting, without too many complications. This Chapter still holds the record for the largest charter group."

Recruits Charter Members

A singular incident in connection with chartering occurred at Washington, D. C., when Potomac Chapter was formed. At that time the ASTE Constitution required a minimum of 25 charter members. After addressing the group, Frank, and Roy Morris, checked the applications and found them one or two short of the necessary number.

"For a while things looked dark for the prospective Chapter," Frank admits, "and we had to do some real talking, but all ended well. Outgrowing its precarious infancy, this group has developed into a sturdy branch of the ASTE tree. It has been particularly successful in securing outstanding speakers for its programs.

"The importance of a good program to attract large attendance and build membership was one of the things I stressed during my administration—and still do. Good meetings are the 'backbone' of a Chapter, and nothing should be spared to put on a 'good show.'"

The first big event of Frank's regime was the Semi-Annual Meeting held in Toronto. In May of that year, the National Executive Committee met with the Canadian group to lay plans for what was perhaps the most successful Society meeting of its kind. This was the last official appearance of Executive Secretary Ford Lamb before his fatal illness.

Effective Cooperation

"Both Toronto and Hamilton Chapters put their shoulders to the wheel," Frank points out, "and by July things were moving smoothly. It was an enjoyable experience working with Ed Barker, Bill Dawson, Arnold Thompson, Ed Greer, Fred Schytte, Norm Wearn, Len Singer, Bob Crawford, Charley Fisher and many others. Before long I hope Canada will have another opportunity to entertain the Society, perhaps at Montreal.

"Then in March we went to St. Louis for the tenth anniversary meeting of the Society. There Doug Burnside and his crew took over and showed us how the Missourians do it. They put on a fine meeting, right from the opening technical session to the banquet, including wartime plant tours."

Reflecting on the progress made by ASTE that year, Frank modestly observes, "I feel that all of the credit belongs to the National Officers and National Committeemen who served with me. Their spirit of cooperation is exemplified throughout the entire Society today—a spirit which has made ASTE one of the most prominent technical organizations in existence.

Membership, Valuable Asset

"A common meeting ground like this Society, where members can exchange ideas and keep abreast of new methods, is unquestionably one of a tool engineer's greatest assets. He is one of the most important men in industry, and his job is a big one, covering nearly every phase of manufacturing from raw material to finished product.

"Tool engineering is, to me, the key to sound economics. The more we produce, the lower the cost, and the wider the distribution of goods to make more people happy.

"The success of a properly designed product depends on the ability of the tool engineer to build it. Where stipulated costs are involved, it is usually up to the tool engineer to find a solution.

"Production methods to increase profits are, of course, his forte. As for sales, no product is successful unless it is uniformly and accurately made—another of the tool engineer's contributions.

"In the past decade the science of tool engineering has made great strides. This advancement is bound to continue through our association with each other in ASTE, where our ideas and achievements may be interchanged," predicts Frank.

Drilling and Boring Tools

Installment No. 5 of a Series

NO MATTER HOW CAREFULLY drills are ground, as discussed in the previous installment, they will not drill a hole in a desired location unless guided. An unguided drill will tend to "walk," and especially so if the workpiece be tilted ever so little, or if there be play in the machine spindle, as there often is.

Where one or only a few workpieces are to be drilled, one can start the hole with a prick punch mark, around which the diameter of the hole has been scribed with a divider. Should the drill creep, it can be aligned with a chiselled groove on the side opposite the runout.

For duplicate drilling, however, drills must be guided by bushings (of which there is a considerable variety) accurately located in the fixture. Exact duplication—that is, within commercial limits—depends on several things:—the initial accuracy of hole spacing in the jig; the fit of the drill in the bushing; wear of drill or bushing, or both, and the skill and care of the operator. For no matter how carefully a drill jig is made, or how true the drill or bushing may be, a workpiece can be spoiled by careless handling.

Up to about 1910, drill bushings were designed and made as required and usually shoulder or plain press fit, without liner. Such special manufacture, however, proved rather costly, not only in the original design and manufacture, but because replacements were not immediately available. Therefore, concerns making drill jigs in quantity began to make bushings in the rough, subject to subsequent sizing and fitting, and this practice eventually led to standardization. They may now be obtained, from a number of makers, to ASA standards.

Typical standardized bushings are shown below. Fig. 1 shows a renewable knurled head slip bushing, such as used when several operations—as drill and ream—are to be performed in the same hole. Fig. 2 shows a slip bushing which is replaced only when worn, and which is therefore retained by a clamp. These bushings are held in a liner, either plain or head type, as shown in Fig. 3, A and B. Bushing C (third from left) is a renewable cam locked bushing, similar to Fig. 2, but with plain head. D is similar to Fig. 2, and E (extreme right) may, like bushing A, be a headless liner or a headless press fit drill bushing, as desired. Superficially, they are alike except for sizes.

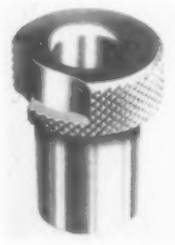
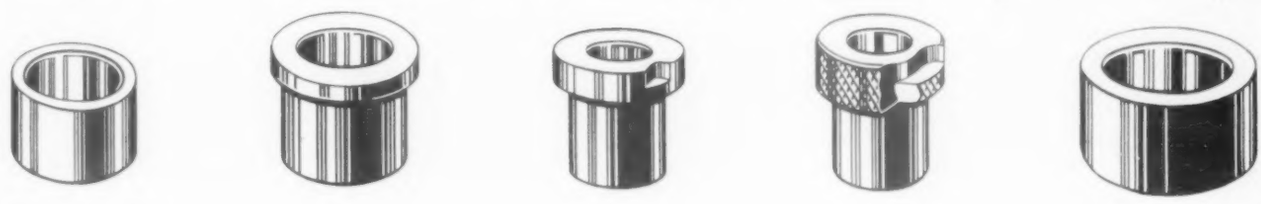


FIG. 1, left, slip renewable knurled head bushing. *FIG. 2*, right, clamp type slip renewable bushing. Courtesy of Universal Engineering Co., Frankenmuth, Mich. *FIG. 3*—A, B, C, D and E, left to right—below.



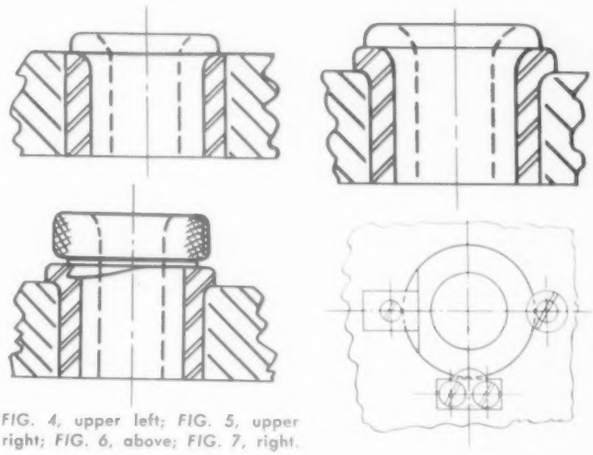


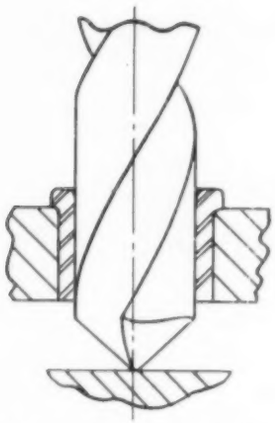
FIG. 4, upper left; *FIG. 5*, upper right; *FIG. 6*, above; *FIG. 7*, right.

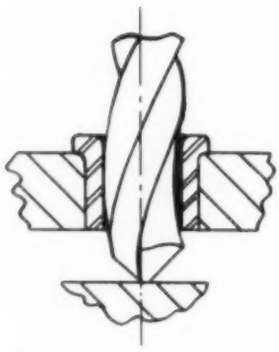
Shown, above, are typical installations. Fig. 4 is a head type press fit bushing in a headless liner, and Fig. 5 a similar bushing pressed into a shoulder liner. Fig. 6 shows a screw or cam lock renewable bushing in a liner, and Fig. 7 typical locking devices. At left, is shown a flat clamp; at the bottom, a round end clamp; and at the right, a lock screw. These clamps are standardized and interchangeable.

One question, often brought up, concerns the length of a bushing in ratio to drill diameter. In the case of a large drill, which would be rigid, the length of the bushing is not particularly important except that the longer the bushing, within reasonable limits, the greater the wearing surface and, consequently, the longer the wear. It must be considered, too, that some of the larger diameter drills are made with a slight back taper; therefore, the diameter diminishes as the drill is recurrently sharpened. And this results in play between the drill and the bushing.

In general practice, however, large drills (see Fig. 8) can be used with comparatively short bushings—say length to diameter 1 to 1 or 2 to 1. Bushings used with templates are usually quite short; however, they should be long enough so that the lips of the drill are well inside the bushing before the point touches the work.

In the case of very small drills, that tend to bend because of their flexibility, the bushing should be quite long in proportion to drill diameter. Fig. 9 shows what happens





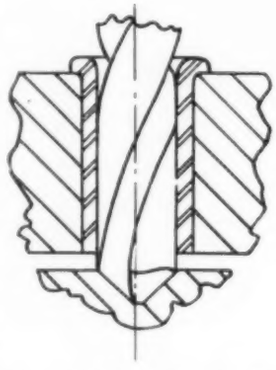


FIG. 8, left; FIG. 9, above; FIG. 10, below.

when a small drill is guided in a short bushing; although, for purpose of illustration, the bending is shown greatly exaggerated. Fig. 10 is a small drill in a comparatively long bushing; also, it reveals one important consideration — that, where fine drills are used, the bushing should be as close to the workpiece as is practically possible. Otherwise the drill will bend or flex between the bushing and the workpiece.

For drills 1/64 to 1/32 diameter, a bushing length of $^3/_8$" to $^1/_2$" would not be too long, and preferably, the gap between the end of the bushing and the workpiece should not exceed three diameters. The shorter the gap, the greater the location accuracy of the drilled hole. Of course, it may not be practical to use a bushing as short as $^3/_8$" or $^1/_2$", especially if slip bushings are used. In that case, one uses a longer bushing with the correct guide length and the rest —that is, from the top down—relieved.

Quite often, curling chips present a problem when drilling. Chips may be broken up by incorporating cutting lips on the bushing, as shown in Fig. 11. Or, they may be diverted, as shown by the bevelled end in Fig. 12. Such break-up or diversion tends to prolong both bushing and drill life, since the chips are thereby prevented from following the flutes of the drill through the bushing. A clever method of chip breaking, by the Republic Drill & Tool Co., was shown in Installment No. 2, September issue, *The Tool Engineer*.

A comparatively recent innovation, in bushings, is the rotary bushing, such as shown in Figs. 13 and 14, manufactured by the Giern & Anholtt Tool Co., Detroit. While originally designed for use as pilot bushings, they may be readily adapted to drilling by pressing in an adapter

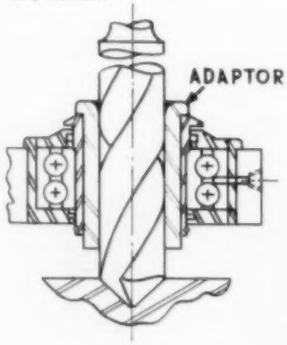
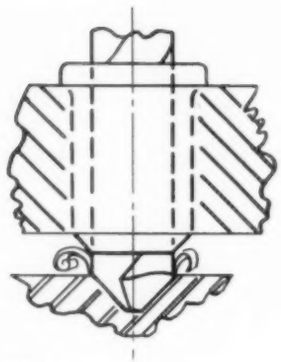


FIG. 13, left; FIG. 14, below. Courtesy of Giern & Anholtt Tool Co., Detroit.



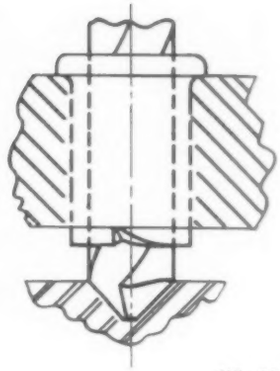


FIG. 11. FIG. 12.

bushing, as suggested in Fig. 14. Because these bushings turn with the work, the only wear to which they are subjected is sliding wear; consequently, these bushings will not only remain true for extended periods, but greatly cut down power consumption.

Another recent innovation, in bushings, is the "Anchor Bushing," introduced by Hi-Shear Rivet Company, Hermosa Beach, California. This bushing, designed primarily for use with templates, is pressed into a formed steel anchor, which may then be spot welded to any flat or curved surface. When worn, they may be as quickly removed and replaced. As the illustration (Fig. 15) shows, they may be used, for spot drilling as well as through drilling, with electric drills or other hand tools.

To insure adequate flow of coolant, to the drills, bushing plates are often made tray type, as suggested by the multiple drilling operation shown in Fig. 16. The drill head used, in this case, is a gearless type manufactured by Zagar Tool, Inc., Cleveland, Ohio, and heads so designed and built may incorporate from two to a hundred or more spindles, all on extremely close centers.

Because drill bushings are so widely used, students should make it a point to thoroughly acquaint themselves with the ASA Standards. While practically every engineering office engaged in tool design has these standards on file, for ready reference, they may be had from any of the manufacturers of drill bushings. They are also included in the A.S.T.E. Data Sheets, available to members.

In the next installment (which will initiate principles of drill jig design) and the several following, we will apply the principles so far discussed to small lot and mass production problems.

End of Part 5. Installment No. 6, this series, will follow in the January issue. The Tool Engineer.

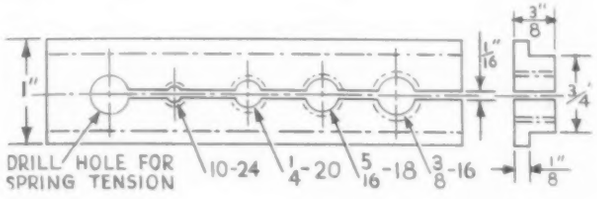
FIG. 15, below; courtesy of Hi-Shear Rivet Co., Hermosa Beach, Cal. FIG. 16, right, courtesy of Zagar Tool. Inc., Cleveland, Ohio.

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Clamp for Screw Slotting

THE TOOL SHOWN is very handy for slotting screws, or for otherwise machining threaded parts. It is made from tool steel, spring tempered, with shoulders as shown so that it can rest on the vise jaws, without falling through, when the vise is opened.



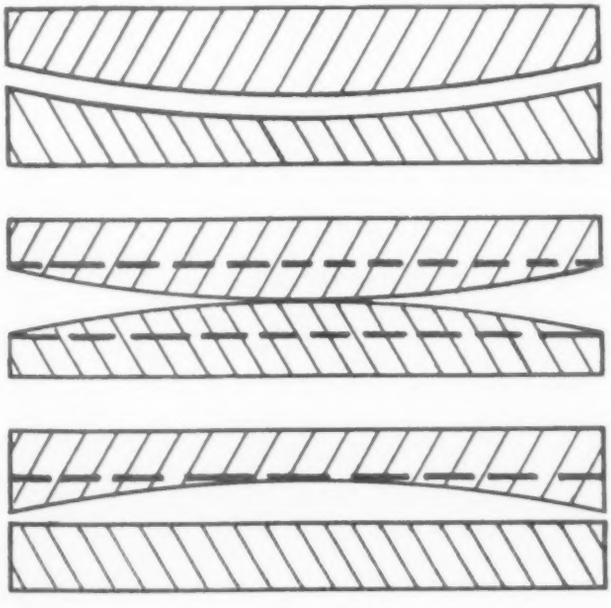
As shown, the tool is stepped for various sizes of threads —as 10-24 to $^3/_8$-16. These increments may be changed to suit, so that several of these tools may include practically all threads in common use. Or, all holes may be tapped alike, for gang machining of a number of similar screws or parts. For screws larger than $^3/_8$, the width (here shown $^3/_4$") must be increased.

Frank J. Peragine
Greater N. Y. Chapter
A.S.T.E.

Scraping Surface Plates

CASUAL enquiry, among a number of men in the mechanical trades, seems to bear out that comparatively few are aware of the procedure for making a true flat surface, such as scraped surface plates. And outside of the optical flat—and of course gage blocks—which are held in microinches, the hand scraped surface plate is just about the flattest flat there is. Scraped by a skilled workman, a cast iron surface plate is usually true within plus or minus one-tenth.

To scrape a plate flat, without use of a master—that is, starting from "scratch"—one planes three plates. One plate is scraped, and this serves as a temporary master for the second plate. When both mate, as shown by red lead smear (prussian blue is too sticky) it will be found that one is slightly convex, and the other slightly concave. Preferably, the concave plate is used as a temporary master for the third plate, which then finishes slightly convex. Convexity is indicated by a slight rock.

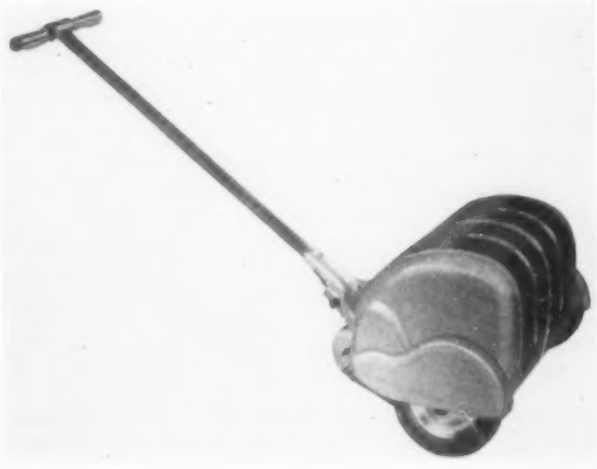


The two convex plates are then scraped, one against the other, until they mate, after which the third (concave) plate is scraped against either of the two. This process is repeated until all three plates show even smear when gaged, any one against the other two. Flatness established, they are given a final mottling (also by hand scraping) although this final operation is mainly for looks and has no material bearing on flatness.

The several steps, for scraping, are shown in the three sketches, the curved surfaces (greatly exaggerated) indicating trial scraping and the dotted lines showing reduction to flatness.

A Tool for the Garden

WHILE SOMEWHAT apart from tools for production, a new lawnmower, manufactured by the LeJay Motors Corp'n, Minneapolis, will no doubt prove as interesting to the rank and file of tool engineers—most of whom have to mow lawns —as it was to the editors when the copy came to hand. It is a self contained, self propelled electric power mower which starts with the snap of the switch, and is complete with battery, charger and motor all contained in the housing.



Its pleasing appearance and protected mechanism indicate good engineering. Of two convenient controls in the handle, one starts and stops the motor while the other disengages the wheels for free running around obstructions. Height of cut is adjustable, and the machine will operate several hours on a charging. It is then plugged into an 110-volt outlet for recharging. Those interested can obtain further particulars from the maker at 1201-02 Plymouth Bldg., Minneapolis 8.

GOOD READING

A Guide to Significant Books and Articles of Interest in the Trade Press

THE USE OF THE DIAMOND PIN IN LOCATING WORK, by Burton R. Garrett, Chief Eng'r, U. S. Engineering Company of New York City, is a reprint of an article which originally appeared in December '45, *The Tool Engineer*, and which, at the time, aroused considerable interest. The author discusses use of the diamond pin as a simple and low cost method of hole location encountered in the design of jigs and fixtures, as well as in the design of gages for precision work. Six charts are included for accurate and convenient calculation of pin diameters.

An unfortunate error, in the spacing of the charts, occurred in the original article; however, the author has incorporated correct charts in the reprint, now available from *U. S. Engineering Company*, 140 Nassau St., New York 7, New York.

WHAT PRODUCTION ENGINEERS WOULD LIKE IN THE WAY OF NEW MACHINE TOOLS, by William F. Pioch, Chief Production Eng'r, Ford Motor Co., in November *Machinery*, emphasizes the important goal of machine tool designers as simplicity of operation and improvement of general appearances. Leakproof hydraulic systems should be made simpler and more readily assembled and disassembled.

More rigid tool-spindles are also a "must," in order to handle higher speeds such as used in machining aluminum and magnesium. Electrical equipment should be flush-mounted for safety. Mr. Pioch also believes that for best over-all appearance, symmetrical contours should be used to produce machine designs of harmony and balance.

He states, for example, that "small pockets created by external ribs can have only one result, and that is untidiness." With three shifts now the order of the working day in auto plants, the machine operator's feeling of "my machine" has been lost. It is, the author concludes, more essential than ever that machine designers incorporate simplicity of design, and easily cleaned surfaces in all machines.

BETTER TOOLS FOR BETTER WORK, in the November issue, *Ingenieria Internacional Industria*, is the latest article of an interesting series appearing in this Spanish-language magazine. The articles aim to tell Latin American industrial leaders just what U. S.-made machines and production equipment will do, as well as how to select and apply it. The magazine is published by Business Publishers International Corp'n (affiliated with McGraw-Hill & Chilton Companies), 330 W. 42nd St., N. Y. 18, New York.

THE STORY OF LEATHER, by J. E. Rhoads, in November *Compressed Air*, is the second of a two-part article, explaining uses of leather for belting, packings, washers and straps; with applications included for such industries as metal-working, mines, iron and steel mills, paper, chemical and textile plants.

Tracing the history of leather from earliest times, the author describes one leather belt 76 inches wide and four plies thick, used on a large Corliss engine. It took the centers from about 300 choice hides, had an installation tension of 30,000 pounds, and satisfactorily carried a full load, 2500 hp, which other types of belting had failed to do.

YOUR LIFE IN THE MACHINE WORLD, by Leighton A. Wilkie, Chairman of the Des Plaines (Illinois) Div'n, DoALL Company, is a 60-page booklet explaining "the ways and whys of today's industrial era; how machines . . . bring modern comforts and better living." Packed with facts and illustrations, the booklet is very readable, and should offer industrialists a valuable "tool" in explaining away many current misunderstandings as far as employer-employee relationships are concerned.

To accompany the booklet, there is a colorful **WALL CHART**, 19" x 25" in size, picturing an arch of progress, of which the keystone represents the important place machine tools occupy as the basis of all modern mass production techniques and present-day high standards of living. Both chart and booklet can be obtained from *The DoALL Company, Des Plaines Div'n*, 254 N. Laurel Ave., Des Plaines, Illinois.

CENTRALIZED LUBRICATION, by A. J. Jennings, Vice-President of The Farval Corp'n, Cleveland, is a reprint article originally published in the June, '46 issue, *Lubrication Engineering*, official journal American Society of Lubrication Engineers. The history of centralized lubrication is traced from the early days of the automobile when pressure guns and nipples were first employed; and, there is also a description of several lubrication devices and systems in current use, especially those adaptable to machine tools.

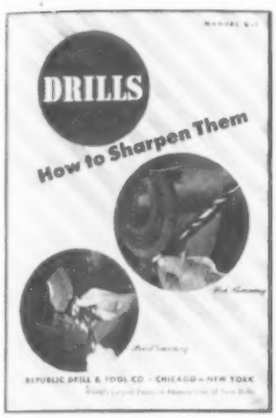
The author points out that care must be taken in transferring lubricant from original drum to individual pumping units on each machine, to avoid contamination. Also, when designing machines with built-in lubrication systems, they should be so engineered as to be fully protected against accidental damage during normal operation of the machine. Good tool designing now places tubing in protected locations, and so arranged that it is readily accessible for attention and adjustment.

ENGINEERS' DIGEST, a technical magazine published by *E. D. Publications, Inc.*, One Madison Ave., N. Y. 10, announces it "has secured exclusive access to information on current Russian engineering and industrial developments." In addition, the last several issues of this monthly magazine have emphasized engineering developments in such foreign countries as Sweden, Holland, France, Germany and Switzerland.

KEY FACTS ABOUT KEYS, by H. F. Williams, in November *Machine Tool Blue Book*, is the first of a two-part article explaining the design and use of square keys, Woodruff, Hypro, spline or feather and tapered keys. Replete with over twenty drawings, the article discusses other types including pin keys, screw keys, keys of square, rectangular, round, hexagonal section adjustable, integral, and block, as well as retainer and special keys.

BULLETINS AND TRADE LITERATURE

Items briefed herein have been carefully selected for their interest and application. Unless otherwise stated, all are available, free, from the stated sources.



REPUBLIC DRILL & TOOL CO., 322 So. Green St., Chicago 7, has available a 24-page, *Manual G-1*, explaining correct principles of sharpening twist drills, complete with drawings and photos showing both right and wrong procedures. In addition to general data on correct point grinding and web thinning, the manual also gives dimensions and angle of proper points for best results in drilling various materials including mild steel and plastics.

STANDARD MACHINERY CO., Providence 7, R. I., has a 16-page folder—*Catalog Section DS*—describing their steel die sets, feeds, scrap cutters, straighteners and ground plates.

O'NEIL-IRWIN MFG. CO., Minneapolis 15, has issued a 40-page catalogue, *Die-Less Duplicating*, detailing their original process of duplicating metal parts or pieces to die tolerance of .001", by using Di-Acro machines individually and in cooperation with each other or as die substitutes.

BRIDGEPORT SAFETY EMERY WHEEL CO., INC., Bridgeport, Conn., has published *Catalog 146*, listing their line of grinders—including floor stand models, vertical surface, heavy duty knife, and cutlery grinders—as well as cut-off machines, buffing lathes, and a complete line of abrasive wheels by vitrified, resinoid and silicate processes.

FELLOWS GEAR SHAPER CO., Springfield, Vt., has released a booklet—*Fellows No. 12H Lead Measuring Instrument*—detailing use of their new, continuous-originating type precision tool for checking the accuracy of helical and other surfaces. For editorial appraisal of this new gear checker, see page 53, October, '46, *The Tool Engineer*.

MASTER ELECTRIC CO., Dayton 1, Ohio, has announced release of the following new folders: *Electric Speedmaster & Cablemaster Hoists*, in capacities up to 3 tons; *Masterdrive*, for motorizing machines; *Big 3 Unit*, for electric generation, tool operation and concrete vibration; *Electric Power Blow Hammers*, for drilling, vibrating and other heavy work; *Portable Grinders & Tools*; and *Gas Engine-Driven Generator Plants*, available in sizes from 500 to 17,000 watts.

HONAN-CRANE CORP'N, 676 Wabash Ave., Lebanon, Ind., has available extra copies of their quarterly publication, *Clean Oil*, Vol. 2, No. 3, devoted almost entirely to case histories of oil purification equipment, covering specific applications on hydraulic equipment used in the manufacture of plastics, metal products, drop forgings, grinding wheels and abrasives.

HOLCROFT & CO., 6545 Epworth Blvd., Detroit 10, has a folder available, *Holcroft Gas Carburizing Furnaces*, describing their controlled-atmosphere gas carburizing process for the mass-production industry. Listed advantages include close control of carbon content and depth of case, soot-free work, and greater output, with reduction in labor costs.

GENERAL ELECTRIC CO., *Apparatus Dep't*, Schenectady, N. Y., has released a new bulletin, *GEA-4572*, describing their recently developed Type CF-2 inkless temperature recorder. Industrial applications of the unit include recording temperatures in generators, transformers, ovens, and air ducts.

SUPER TOOL CO., 21650 Hoover Rd., Detroit 13, has a folder, *Standard Carbide-Tipped Solid End Mills*, to guide users in selection of the correct carbide-tipped end mill. It also lists proper feeds and speeds at which tools should be run to obtain maximum results.

CARPENTER STEEL CO., 354 W. Bern St., Reading, Pa., has published a 12-page booklet, *Two Steels Simplify Your Alloy Needs*, listing two chrome-nickel alloy steels, No. 5-317 and No. 158, claimed to meet 95% of users' alloy steel requirements for such products as gears, shafts and bolts.

FULLER BRUSH CO., Hartford, Conn., has released an attractive booklet—*Fuller Designed & Built*—picturing the company's production facilities, engineering department, and Machine Tool & Gauge Div'n, all of which are now available to manufacturers who want "to make a better product at a profit."

MILLER MOTOR CO., 4027 N. Kedzie Ave., Chicago 18, has published *Hyd-Air*, in magazine style, claimed to be the first and only house organ devoted to air and hydraulic cylinder manufacturing. News about die cushions, boosters or intensifiers, counterbalance cylinders, and dual pressure pumps is also included in this interesting publication.

NAT'L BROACH & MACHINE CO., 5600 St. Jean, Detroit 13, has released a folder, *Shaving Greatly Facilitates Camshaft Gear Production*, explaining advantages gained by use of their Red Ring Rotary Shaving Machine.

SYLVANIA ELECTRIC PRODUCTS, INC., Dep't MA-3, 211 Derby St., Salem, Mass., has released an 80-page *Fluorescent & Maintenance Manual* describing fluorescent lamp operation and problems encountered in maintenance of fluorescent systems. There is much material on trouble shooting, inspection, cleaning and testing. Priced at $1.00.

North East West South in Industry

P. F. BRONCKHURST is in charge of the recently opened western office of **Hydropress, Incorporated** — builders of hydraulic presses and rolling mills — to be located at 1065 Gas & Electric Bldg., Denver, Colorado. Mr. Bronckhurst is well known as a consulting engineer on machine tool and hydraulic equipment applications.

John S. Barnes Corp'n of Rockford, Ill., hydraulic equipment manufacturers, has placed **E. C. HAWKINS** in charge of the Chicago office at 135 So. La Salle Street.

GUY L. CARPENTER, owner, **Carpenter Eng'g Co.,** and 1945-'46 Secretary, Detroit Chapter, A.S.T.E., announces his company's new location at 2642 E. 7 Mile Rd., Detroit 12. Builders of complete tooling programs as well as special machinery, the concern also has an associate div'n, **Hoover Tool & Die Company,** Detroit.

THE STEVENS-JEFFREY COMPANY formerly of 226 Boulevard Bldg., Detroit 2, Mich., has moved to a new and larger location at **6910 Chase Road, Dearborn, Michigan.** This company serves as nat'l sales representatives for **Reef Industries** and **Qualified Gage Company.** Reef Industries manufactures the Reef Adjustable Form Gage; Qualified Gage Company produces reversible thread gages as well as production parts requiring precision-ground threads.

BERT CARPENTER CO., 208 Hanna Bldg., Birmingham, Mich., has been appointed exclusive representative for **Ferracute Machine Co.,** Bridgeton, N. J.—manufacturers of power presses, super speed presses and special sheet metal machinery—covering eastern Mich., and northern Ohio.

LODGE & SHIPLEY MACHINE TOOL CO., Cincinnati, has acquired all rights of the "Duplimatic" contour control device from the Detroit Universal Duplicator Co., Detroit. A superimposed impulse type duplicating control for interchangeable use on toolroom and production lathes, the Duplimatic employs templets to reproduce a wide variety of shapes in turning or boring operations. Purchase of rights to the device is in line with an expansion program recently launched by Lodge & Shipley.

R. D. HOUGHTON, has been named Gen'l Mg'r, *Industrial Machinery Div'n,* **Milwaukee Chaplet & Mfg. Co.,** Milwaukee, Wis., according to announcement by **Paul F. Rice,** President. Mr. Houghton, formerly export executive with Chain Belt Co., will be in charge of market expansion for Milwaukee Chaplet's machinery lines.

E. B. ANDREWS (left) has been named Sales Mg'r, **O. K. Tool Co.,** *Div'n of Aerodynamic Corp'n,* Shelton, Conn., according to **Alfred L. Marshall,** Gen'l Manager. Mr. Andrews was previously with E. A. Kinsey Company of Cincinnati, and served during the war in Washington on special assignment with the Ordnance Department.

CHARLES COLLINS has been named vice-president in charge of sales and advertising, **Gerotor May Corp'n,** Baltimore, Maryland. With the company since 1928, Mr. Collins has served as gen'l sales mg'r and advertising director since 1940. Coincidentally, **T. A. Button** is the newly elected vice-president in charge of production.

DR. COURTNEY C. BROWN, head of Petroleum Economics Div'n of Standard Oil Company (N. J.) has been appointed vice-president of the **World Trade Foundation of America,** 15 Broad St., N. Y. 15, in connection with research activities affecting improvement of two-way world trade. The announcement was made by the president of the Foundation, **George H. Thornley.**

MALCOLM S. CLARK (right) President, **Warren City Mfg. Co.,** Warren, Ohio, recently announced a new line of "Warco" welded steel presses. Also announced are the appointments of **A. L. Carlson** as Sales Mg'r, **Jack F. Anschuetz** as Ass't Sales Mg'r, and **Albert Clements** as Chief Engineer. Warren City Mfg. Company is a subsidiary of **Federal Machine & Welder Co.,** of which Mr. Clark is also the president.

As announced by **A. M. Sargent,** President, **PAUL HACKER** has been named Operating Mg'r, **Pioneer Eng'g & Mfg. Co.,** Detroit. For the past four years sales mg'r—latterly operating mg'r—of the **Pioneer Pump & Mfg. Co.,** Mr. Hacker will direct all activities of the Pioneer staff of engineers, designers, processors and draftsmen. Mr. Hacker's background in mechanical eng'g includes 27 years with Packard Motor Co., where he made an enviable record while in charge of tooling and plant setup for the Rolls-Royce engine and the Packard marine engine.

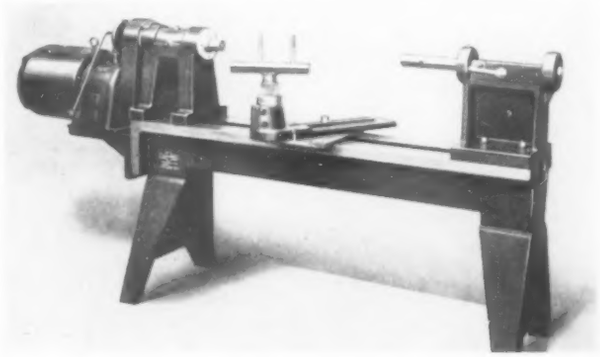
First national **MATERIALS HANDLING EXPOSITION,** to be held at Public Auditorium, Cleveland, Jan. 14-17, will feature exhibits and papers on production and assembly line materials handling, as well as handling for receiving, shipping, loading and warehousing departments. Admission to the four-day session can be obtained from the exposition management, **Clapp & Poliak, Inc.,** 37 Wall St., N. Y.

After a brief illness, **ROBERT S. DRUMMOND,** Detroit industrialist, died October 9th, at the age of 62, in Ford's Hospital in that city. A graduate of Lehigh University, Mr. Drummond was employed in Moline, Ill., before coming to Detroit where he was associated with Gear Grinding Machine Co., the Detroit Steel Products Co., and at the time of his death, the Nat'l Broach & Machine Co., of which he was founder, president and director. Among many articles, Mr. Drummond was author of "Gear Shaving & Checking," January, 1946, *The Tool Engineer.*

TOOLS OF TODAY

Metal Spinning Lathe

A NEWLY DEVELOPED **METAL SPINNING LATHE**, by the *Ermac Company*, 5531 South Vermont, Los Angeles 37, is now available for immediate delivery. Of particular interest, to industry, is the fact that the lathe was developed by an experienced metal spinner who incorporated several features adding to the safety of operation. These include a new, positive lock, adjustable tool rest and a positive lock, rotary cam tail stock and—marking a forward step in metal spinning lathe construction—heavy duty, taper roller bearings, running in oil.



A 2-speed, 5 hp motor, with 4-speed Lima drive gives 8 spindle speeds, ranging from a high of 1730 to a low of 205 rpm. Differing from the lathes now on the market, changes can be made from low to high speed, or high to low *without stopping the spindle*. Push-button operation makes the change. High speeds are 1730, 930, 555, and 420 rpm; low speeds run 850, 460, 270, and 205 rpm.

Specifications on the new lathe are: 27" swing, 6' straight bed. Distance between centers, 32½". Size of spindle, front bearing 2" I.D., 3.671" O.D., rear bearing, 1.437" I.D., 3.548" O.D. Ermac Company is in a position to supply metal spinners with a complete line of spinning tools to go with the new lathe, also, all types of chucks and forms.

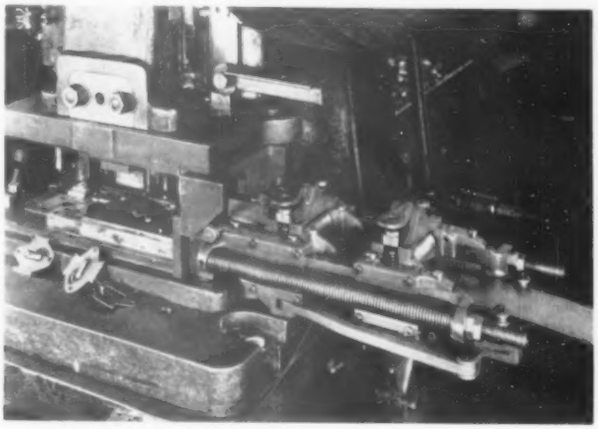
New Work Rest Blades

A CARBIDE-TIPPED **WORK REST BLADE** of new and novel design, for centerless grinders, is announced by *Scully-Jones and Company*, 1901 So. Rockwell St., Chicago. The blade is segmented, as shown, and in the event of damage to one or several segments, the tool may be returned to the factory and the damaged segments replaced at low cost.

This feature overcomes a fault of work rest blades tipped with a solid strip of carbide which, on being damaged, must be replaced at a considerable cost. As another feature, the segmented slots are self cleaning. Chips and grit are carried away by the coolant; besides, harder and longer wearing carbide may be used, giving longer runs between grindings.

New Die Feeds

TWO NEW **PUNCH PRESS FEEDS**, providing for more complete coverage of the wide range of stock sizes and feed lengths encountered in the metal stamping industry, are announced by the *H. E. Dickerman Mfg. Co.*, Springfield, Mass., manufacturers of the Dickerman 2" and 4" hitch feeds and 3" die feed.



Known as 6" Dickerman Die Feeds, they are available in two sizes, one feeding coiled strip in any practical combination of thickness up to 3/16" and width up to 4", the other feeding coiled strip in any practical combination of thickness up to 3/16" and width up to 6". Maximum feed length, for both of these feeds, is 6" on presses having a stroke of 3" or more, and approximately double the stroke on others. This increase in range of feed lengths is extremely desirable for obtaining reasonable feed lengths in cases where only short stroke presses are available, or where, due to limitations imposed by the die, the effective feeding portion of the press stroke is greatly reduced.

New Expanding Arbor

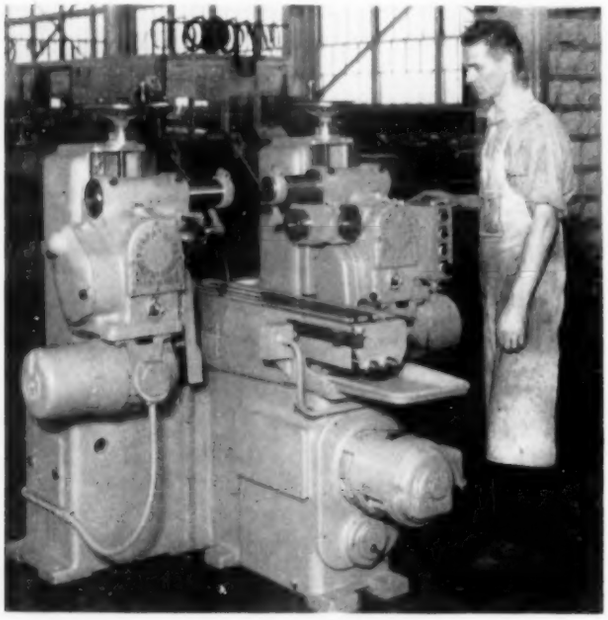
THE *Asco Corporation*, 874 East 140th St., Cleveland, announces a new production tool for speeding certain machining processes. Called the Asco "Auto-Arb," the tool is an **EXPANDING ARBOR** for use on secondary operations where workpiece is held by the inside diameter. Its design permits chucking and unchucking workpiece without stopping the spindle when used on a screw machine or lathe with standard collet.

It expands accurately, maintaining perfect concentricity with the collet. It can also be used to good advantage on drill presses or milling machines with collet devices. Other advantages claimed are: no other tools required for chucking workpiece, no danger of damaging workpiece, works equally well in "blind" holes and positive collet and work stop.

The "Auto-Arb" is made in sizes from 3/8" to 1", at 1/64" intervals, with entire range accommodated with 3 collet sizes. Larger sizes may be made to special order.

New Duplex Milling Machine

A NEW SMALL duplex type **RIGIDMILL**, by the *Sundstrand Machine Tool Company*, Rockford, Ill., offers many possibilities for reducing time and machining costs by milling two surfaces simultaneously on opposite sides of small workpieces such as lock, typewriter, gun and similar parts, or lighter cuts on large parts.

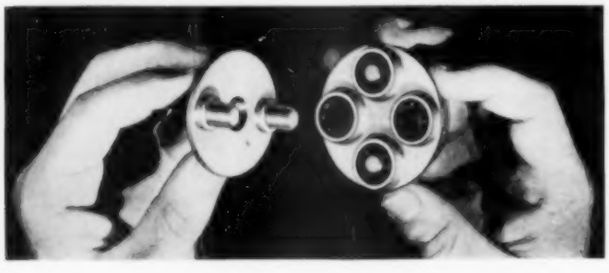


The machine—No. 0 Size—has two horizontal opposed spindle heads with independent vertical adjustment from 2" to 13" from top of table to center line of spindle. Thus, cuts on opposite ends of a part can be made at different relative heights. Spindle heads are of independent motor drive type, and are available in two speed ranges—25 to 1200 rpm or 50 to 2400 rpm. Speed changes are by pick-up gears and each set of 2 gears provide 4 possible speed changes.

For greater range, the columns which carry the spindle heads are mounted and keyed to the base members; however, they may be located in "in," "intermediate" and "outer" positions. This provides a spread increase of 7". The machine table is 8" x 41½", with maximum feed stroke 12" and feed infinitely adjustable from ½" to 38" per minute. Rapid traverse rate is 325" per minute.

Small Couplings Available

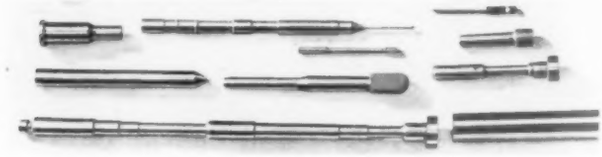
SMALLER **MORFLEX COUPLINGS**, designed for the low power-takeoff of fractional-horsepower drives, have been added recently to the line of power transmission equipment manufactured by *Morse Chain Company*, Detroit. Available in two new sizes, to handle 3 and 9 foot-pounds torque, the couplings weigh approximately ½ pound and 1¼ pounds, respectively. Maximum rpm is 3600 for both sizes, with choice of stock bores ranging from ¼" on the smaller to 1" on the larger.



Swiss Type Converters

A NEW **SWISS TYPE CONVERTER**, offered by *Oxford Engineering, Inc.*, Oxford, Mich., is designed to make any lathe or similar turning tool into a quality production machine for multi-diameter parts. The device has been shop tested, and perfected, by several years' use on close-tolerance war work.

Tooling is by means of simple cams, which the user can make in his own plant, and when not in use, the Converter can be easily removed and stored, with settings intact, for future use. Practically any shape, or combination of shapes, can be produced, from needle point to ½" O.D. and from ¼" to 6 ft. in length, depending on the lathe used. Production, using original stock of general cold rolled finish, is claimed to be unusually fast, with dimensions held to close limits of tolerance. The tool, and typical samples of work, are shown in the two photos.



New "Gun" Tap Sharpener

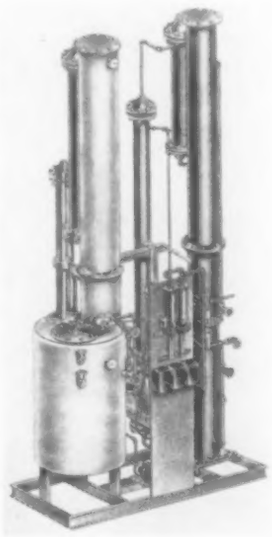
A NEW SPIRAL POINT (or "gun") tap sharpener, called the Blake **FLUTE GRINDER**, is announced by the *Edward Blake Company*, 634 Commonwealth Avenue, Newton Centre 59, Mass. The new machine provides the positive, mechanical controls necessary for the accurate, speedy and easy sharpening of both spiral points and straight flutes, not only of taps but also of other straight and angular-fluted tools, such as countersinks, drills, and other hole cutting tools.

Operational simplicity permits an unskilled operator to quickly master its handling, while unique safety features inspire confidence in its use. The method of holding the tap is unique. The shank is held in a special radius-grip draw-in collet which grips with just enough force to keep the tap from turning. The end of the tap is supported by means of a backrest bushing, an arrangement providing positive and vibrationless holding—a requisite for spiral point grinding.

The workhead, which is provided with a quick index mechanism, can be swivelled to any desired angle for grinding either straight flutes or angles.

Neutralene Gas Producer

A NEW Neutralene **GAS PRODUCING EQUIPMENT** providing a neutral, CO_2-free, dry, combusted gas for heat treating, without decarburization, has been announced by the *General Electric Company*. The Neutralene gas atmosphere is especially suitable for bright annealing, clean hardening, and furnace brazing of medium and high carbon steels, hardening of high-speed steels, and sintering of high-carbon ferrous metals.

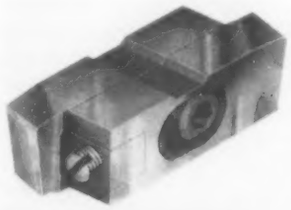


Differing from the conventional system of using an atmosphere gas converter plus a CO_2-removal equipment, the Neutralene producer consists of a combined combustion chamber and reactivating tower, CO_2-absorbing tower, gas cooler, heat exchanger, and liquid cooler. A refrigerated gas cooler and an activated alumina dryer are furnished for drying the gas.

Without going into the details of the analyses of Neutralene gas, or the operation of the equipment—which may be had from the manufacturer on request—it can be stated that the Neutralene system saves about 18 kw hours per thousand cubic feet of gas produced, or over $1000 per 6000-hour year with a power rate of one cent per kw hr. This is because the energy previously wasted in the water jacket of the atmosphere gas converter is now utilized.

Rough Boring Tool

A NEW **ROUGH BORING TOOL** has been added to the line of tools manufactured by *Madison Manufacturing Company*, Muskegon, Michigan. This new tool is an extension of the Madison line of reaming and finish boring tools, and is said to offer several exclusive features that make it highly adaptable to both production and jobbing shop operations. A block type tool (similar to the Madison reaming tool) it differs from conventional types in that the cutting blades are not inserted into a block—rather, the blades themselves form the cutting block.

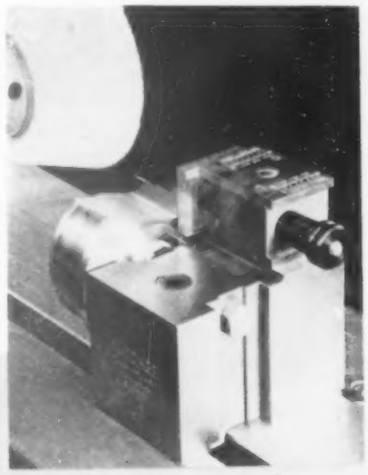


A few of the chief advantages of the new tool are quick changing of cutters, adjustment of cutter size before mounting in bar and positive centering of cutter in bar, thereby equalizing the load on the cutting elements.

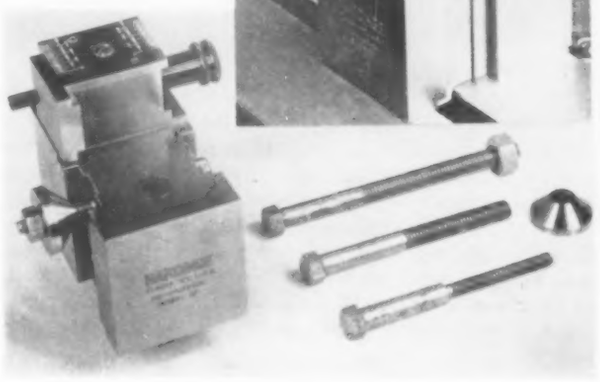
A single micrometer thread screw, turned by a screwdriver, expands both blades equally from the centering slot on the blades themselves. In field tests, as much as an inch and a quarter of stock has been removed at a very heavy feed, and an amount of stock which required three passes with a single point tool has been removed in one pass with this new Madison Rougher.

Hardinge Checking Fixture

A **SHARPENING AND CHECKING FIXTURE**, for circular form tools, has been developed by *Hardinge Bros., Inc.*, Elmira, N. Y. With this fixture, circular form tools may not only be sharpened with or without top rake, as desired, but rakes once established may be duplicated indefinitely. Also, they may be checked in the same fixture, which also serves as a gage at the one setting.



The fixture may be used for right or left hand cutting tools with plain hub, or left or right hand tools with octagon or serrated hubs. Mounted on the table of a surface or center grinder—as shown in the photograph—the correct grinding, for radial (on center) or top rake is determined by means of a right or left scale shown at top right in the illustration.



New 20-KVA Mobile Brazer

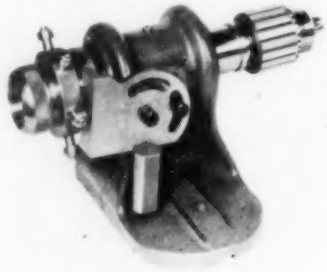
A NEW 20-KVA **PORTABLE BRAZER**, with water cooled tongs, by the *Westinghouse Electric Corp'n*, is designed for general brazing purposes. The entire unit, which is self contained and enclosed in a circular steel housing, has a contactor for energizing or deenergizing the brazing circuit, an adjustable heat brazing transformer and a cooling system for the tong cooling water.

Diameter of the unit is kept small—24"—for lowering through hatches, water-tight doors and manholes. The unit requires only a connection to a 220 or 440-volt power source, and a clamp type entrance bushing is provided, at the rear of the brazer, for the incoming primary cable. All controls, connections and outlets are located in a control panel, at the front, while a foot switch — which controls the length of time during which current is applied—has a length of cable to permit of remote control on location at station. Literature with complete information, may be had by writing the company at Box 868, Pittsburgh 30.

Axial Relief Fixture

A NEW **AXIAL RELIEF GRINDING FIXTURE,** covering an exceptionally wide range of operations, has recently been placed on the market by the *Govro-Nelson Co.*, 1931 Antoinette, Detroit 8. Especially adapted to grinding cutting edges, steps, flutes and chip relief on milling cutters, burring tools, counterbores, countersinks, end mills, reamers, drills and taps, it performs operations which formerly required a variety of different grinding fixtures.

All adjustments are simple, visual and external, and the fixture is instantly convertible from right to left hand, and vice versa. It can be used on surface grinders as well as cutter grinders, and performs most of the grinding jobs with standard grinding wheels. The axial relief is automatically equalized on all flutes.



Drill for Hard and Soft Metals

THE *Enesay Tool Company,* 2240 Sepulveda Blvd., Los Angeles 23, has announced a new and what is claimed to be a practically breakproof drill which cuts through intensely hard and very soft metals with equal facility. It readily drills through steel hardened to 68 Rockwell "C"—harder than file steel—and makes possible fast, precision drilling on metals so hard that their handling was previously considered impractical.

The drill is constructed of a new alloy, having a tensile strength of over 45,000 psi, which makes possible the penetration of hardened steel without impairing the metallurgical properties of the metal. Only the metal removed during drilling is softened, the surrounding metal remaining unaffected.

The drill is available in all standard and special sizes, and is fully described in a four-page illustrated brochure, available on request.

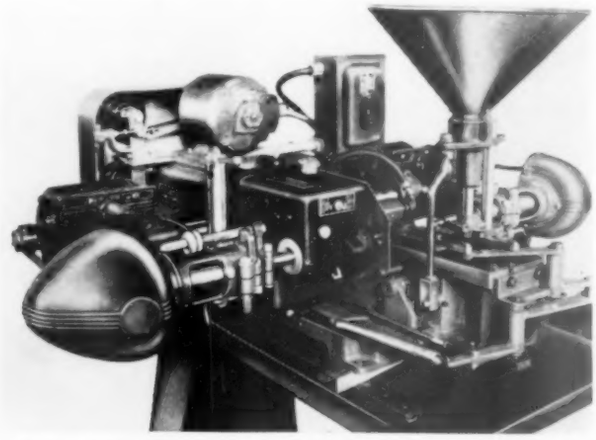
Cleveland Indexing Head

DESIGNED PRIMARILY for accurate indexing of tools when grinding to exact concentricity, a new **UNIVERSAL INDEXING HEAD,** by *Grinders & Fixtures, Inc.*, 1255 W. 4th St., Cleveland 13, is applicable to a wide range of work requiring indexing at different angles.

As seen by the photograph, the head may be swiveled three ways, for plain and compound angles, with angles determined by graduated dials. Note that the spindle has a dial in addition to the index plate. The tool is designed to hold all straight and taper shank tools from 1/16" to and including 1½" diameter, and is accurately calibrated for the resharpening or grinding of taps, counterbores, reamers, end mills, milling cutters—in fact, anything from single to multi-flute tools. Complete information on this tool may be had from the makers.

Automatic Drill and Tapper

COMBINED SECONDARY OPERATIONS—drilling, tapping, riveting, grinding, end-milling and many others—are controlled automatically by the Pond **OPERATOR MODEL 600,** an automatic control unit developed by the *Pond Engineering Company* of Springfield, Mass.

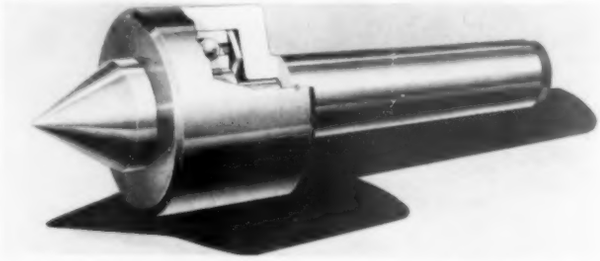


The illustration shows a Pond Operator on a standard base for automatically drilling, counter-sinking and tapping on the center of a flat surface milled in the side of a cylindrical blank. Individual handling of the work is eliminated by hopper feed, and positioning and holding of the part are also entirely automatic. A production increase of 25% and a 90% saving, in direct labor costs, may be expected on this installation.

The Operator is powered by a ⅓ hp motor, and a minimum of 70 lb air pressure is required. Four air valves are standard equipment, but additional air valves or mechanical cams may be added by extending the cam shaft outside the housing. The air valve cams are adjustable for the frequency and duration of impulses per cycle, and the cycle speed is adjustable from two seconds to one minute, controlled by a simple adjusting knob. Longer cycles have also been made available on special order.

Coles Live Centers

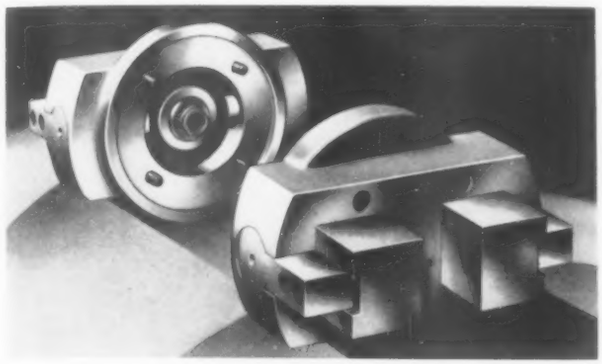
COLES LIVE CENTERS, by the *Raymond Corp'n,* 412 Republic Bldg., Cleveland 15, are designed to withstand the heavy loads and end thrusts engendered by modern high speed turning operations. A full length rotating center point, extending deep into the shank of the housing, is provided to minimize chatter and sway at point of contact.



Full radial load is taken by matched Duplex ball bearings, with a thrust compensator provided to move backward with multiplying loads and to minimize danger of overloading. An Oilite bearing, deep in the shank, provides the leverage to avoid side sway. Lubricated for life, these centers are guaranteed for true concentricity within .0002".

Power Chucks by Skinner

The Skinner Chuck Company, 344 Church St., New Britain, Ct., has resumed manufacture of the series 1400 and 1400-A self-centering, power-operated, two-jaw **BOX-BODY CHUCKS**, production of which was suspended due to commitments during the war. These chucks (shown in the smaller photo) which were formerly designed to hold irregular shapes, are currently available in 8¼" and 12" diameter sizes.



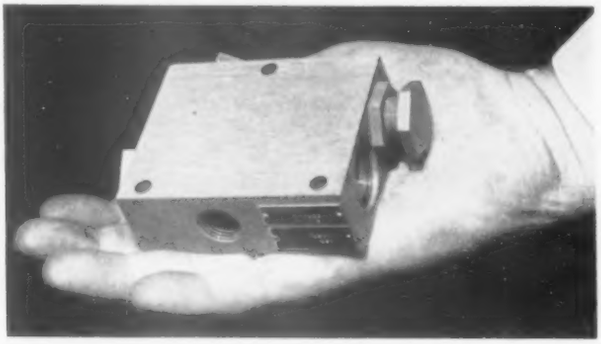
As a "new" among Tools of Today, the company announces a two-jaw **COMPENSATING POWER CHUCK** —Series 23100-A—designed to drive work on centers where exceptionally heavy cuts are being taken with carbide tipped tools at higher spindle speeds. The work is accurately gripped by two "floating" jaws, of non-adjustable type, and the top surfaces of the solid master jaws are machined with tongue and groove to ASA standards. Both chucks are precision tools, conforming in every way to rigid Skinner standards of quality.

New Tube Expander

A NEW **SPECIAL ARCH TUBE EXPANDER**, by *Richard Dudgeon, Inc.*, 24 Columbia St., New York 2, reaches through the length of the tube to roll the far end of boiler tubes when boiler construction does not permit usual access. The tool eliminates climbing into the fire box, also, avoids dismantling the outer boiler jacket or cutting through the jacket with an acetylene torch to gain access to all of the tubes.

Hydraulic Cut-out Valve

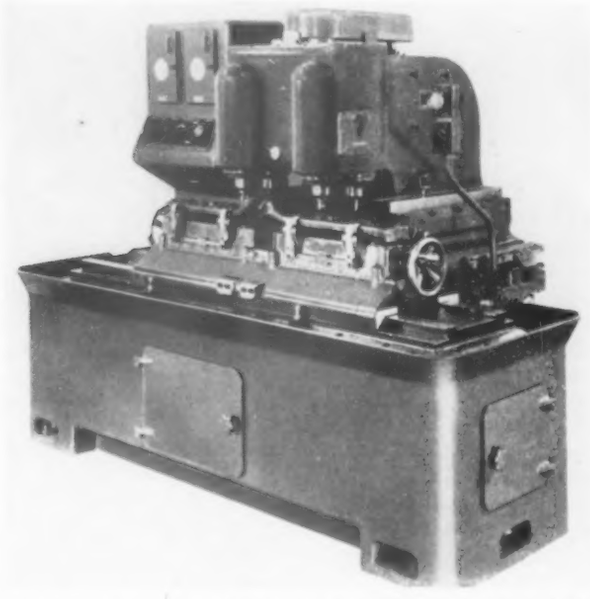
A NEW **HYDRAULIC CUT-OUT VALVE**, claimed to be applicable in virtually every branch of industry, and outstanding for its low cost as well as novel design and operating features, is announced by *Electrol, Inc.*, Kingston, N. Y.



The compact housing is only 1¼ inches deep and, in plan form, measures only 2¾ by 3½ inches, and the device is featured by positive seating of the valves, few moving parts, small size, long operating life, low pressure drop, and adaptability to installation in small, narrow and hard-to-reach places. Because all the ports are in the same plane, this new Electrol cut-out valve can be conveniently located where it will be out of the way or best fit into the over-all design of the equipment on which it is installed.

Three of the ports—pressure, return and system—are ⅜ inch NPT female ports; the fourth is a ⅛ inch NPT bleed port.

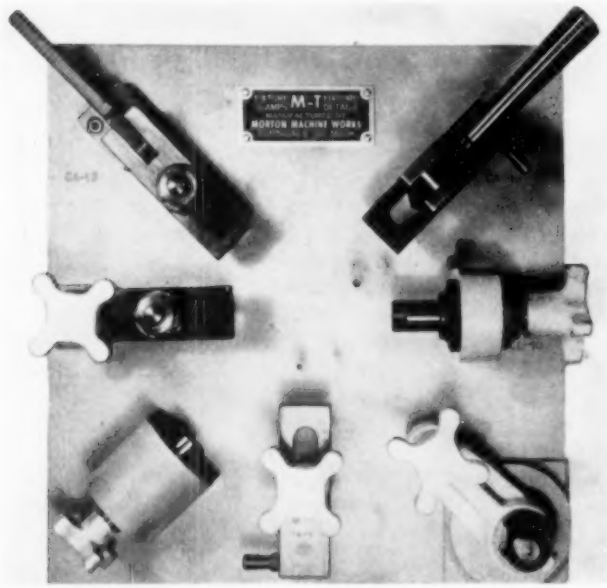
Two Stage Miller



A SPECIAL PURPOSE, hydraulically operated and electrically controlled, **TWO STAGE MACHINE**, for milling the bosses on cylinder head castings, has been completed by *Hydraulic Machinery, Inc.*, 12825 Ford Road, Dearborn, Michigan. Cycle of operation is as follows: (1) Operator unloads and loads part in station away from work position. (2) While this is being done, milling head moves in, to machine part at work station. (3) Milling head retracts. (4) The part just loaded moves into work station. (5) Repeat production, 90 per hour. Overall machine dimensions: 48" wide x 60" high x 72" long.

Improved Jig Components

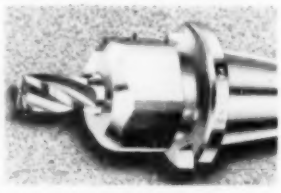
STRAIGHT, ANGLE and wedge-screw designs, cam-type lever-operated units for a wide range of work-holding requirements are included in a recently improved line of **JIG AND FIXTURE COMPONENTS**, manufactured by *Morton Machine Works*, 2422 Wolcott St., Ferndale 20, Mich. Each is available from stock in a range of sizes. Unit parts are made of heat treated alloy steel, and, as one example, the lever unit shown to the upper left in the illustration employs a strap that is pin-connected to the cam lever and is slotted for its back-up stud so it can be slid back to clear the work when the lever is in released position. The strap in this unit measures $\frac{5}{8}$ by $1\frac{1}{4}$ in. by 4 in. to $\frac{3}{4}$ by $1\frac{1}{2}$ by 6 in. in six stock sizes. Minimum and maximum height under the strap is $\frac{7}{8}$ and $1\frac{1}{4}$ inches. Literature provides details for each assembly, and also for individual parts, which can be purchased when the user desires to make his own assemblies.

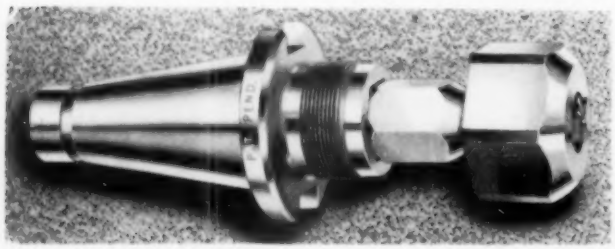


"Selch" Holder and Tools

INTRODUCED BY THE *Galanot Products Co.*, 883 S. Union Ave., Alliance, Ohio, as a revolutionary method applied to rotary cutting, the **"SELCH" TOOLS** (illustrated below) employ a double cone and a hex driver to insure stability.

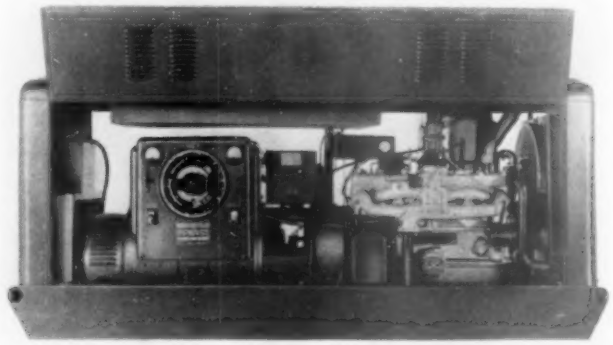
With the hex drive, there can be no slipping, while the concentrically ground cones accurately center the tools in the holder and provide equal cutting depth and load on each flute of the cutter. As claimed by proven tests, slots can be milled from 6 to 9 times deeper than recommendations in mechanical hand tools, without reduced cutting speeds while one pass precision cuts are attainable with smoothness of finish predominating.





Gas-Electric Arc Welder

A COMPACT combination drive **WELDING MACHINE**, by the *Hobart Brothers Company*, Troy, Ohio, consists of a standard 300 amp. generator and 20 hp induction motor mounted on a heavy solid shaft coupled to a Chrysler 6-cylinder Industrial Engine through an over-running clutch coupling. This coupling provides a positive drive to the welding generator; however, should the gasoline engine be stopped and the generator be driven by the electric induction motor, the clutch will automatically over-run, or free wheel. No levers or pins are required to be moved.

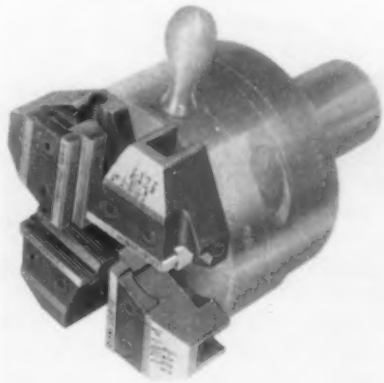


The induction motor is wound for dual voltage 220/440, and change-over is effected by throwing a double-throw knife switch to either voltage. The motor is started by a pushbutton across-line contactor, designed to work in conjunction with the voltage change-over knife switch so that no changes are necessary, in the contactor, for 220 v. or 440 v. operation.

The gasoline engine is furnished with an idling device, and all other features usually carried by the standard Hobart 300 amp. gas drive. With this unit, the contractor—or job welding shop operator—may take advantage of the cheapest power available; for, should 220 v. or 440 v. three-phase be available, he is immediately ready to take advantage of that. And, if no electric power is available at the job site, he may fall back on the gasoline engine.

Double Diameter Chasers

AMONG COST-CUTTING TOOLS, *The Landis Machine Company*, Waynesboro, Pa., has developed a Double Diameter Tangential Type **GROUND THREAD CHASER.** All surfaces of the chasers have the thread form ground after hardening; as a result, they are guaranteed to hold within a class three fit on both diameters.

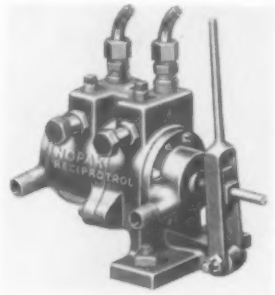


Because of limitations in the difference between the two diameters for which the chasers can be furnished, however, it is essential the threads produced, on both diameters, be of the same form and pitch. Each set of chasers must be engineered for the threading job on which it will be used, and it is recommended that both diameters and the workpiece, be of fairly short length for best performance.

Unique Speed Control Valve

A DEVELOPMENT of rather unusual interest, to industry, is a new **SPEED CONTROL VALVE**—the Nopak Reciprotrol Valve—recently introduced by the *Galland-Henning Mfg. Co.*, 2756 So. 31st St., Milwaukee, Wis. Said to provide a combination of control features never before offered in a single 4-way valve, for operating air or oil hydraulic cylinders at line pressures from 50 to 300 lbs., the new valve will:

(1) Positively regulate stroke speed in both directions independently. For example, a double-acting cylinder may be operated at top speed in one direction and at one-quarter speed on the return stroke. In addition, it permits a choice of cycle speeds from 0 to 500 complete cycles per minute, depending upon cylinder stroke and diameter.



(2) The built-in controls, which are a feature of this valve, permit accurate regulation of the stroke-length from the full length of the piston rod to a small fraction thereof. (3) The fractional cylinder stroke may be located, precisely, at any desired point within the full stroke length.

The valve is adaptable to fully automatic, semi-automatic, or manual operation. Because it uses its own exhaust to reverse its operating cycle with explosive speed, it permits up to 500 reciprocations per minute on small diameter, short-stroke air cylinders. Piston travel stops at precisely the same point on every stroke through lightening reversal of the ring valve.

In addition to operating any size or make of double-acting cylinder, it can be used to operate two single-acting, spring-return cylinders. It may also be set up in batteries to operate a large number of cylinders simultaneously in succession. In fact, early responses to its announcement indicate a limitless number of applications for this new automatic operating valve.

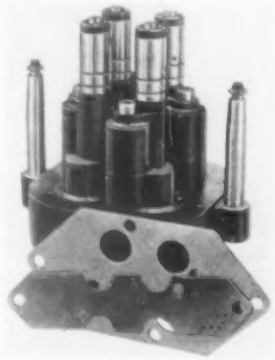
Metal Cut-Off Saw

A NEW METAL **CUT-OFF SAW**—the No. 00—by the *Motch & Merrywether Machinery Co.*, Cleveland 13, has been especially designed for accurate and economical sawing of ferrous and non-ferrous metals. The machine will saw ferrous bars up to 1¼″, non-ferrous to 2″, and tubing and shapes to 2½″. The machine is available in either hand or power feed to the saw carriage, or, it can be equipped with automatic cycling for both work and feed.

General features include ease of manual operation, employing long lever arm feed; high productivity due to ease of operation and the stamina of the "Triple-Chip" saw blade; automatic clamping through a spring tension cam-operated mechanism locked to the feed lever, and a minimum of floor space required, due to its vertical construction. The user has a choice of three saw blade speeds—160, 247 and 560 sfpm.

New Multiple Drill Head

DESIGNED AND BUILT by the *Wisconsin Drill Head Co., Ltd.*, a new idea in multiple, adjustable **DRILL HEADS** is said to overcome many of the limitations found in earlier types of multi-drill heads. In this head, which is entirely gear driven, each drill revolves completely around two different centers, each with $^{15}/_{16}$″ radius.

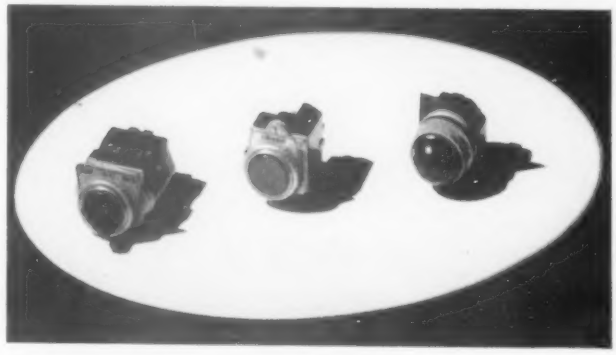


This means that each drill point can be located and locked at any point in the area of a $3^{3}/_{4}$″ circle. As each circle overlaps at least one other circle, the infinite variety of hole patterns which can be produced is limited only by the number of spindles employed and the combined area of the various spindle circles.

As another feature, a set of templates is furnished for every hole-pattern of bolt-circle which the user may wish to drill. The set consists of two templates—one for positioning, one for locking—which combine into a novel locking feature assuring rigid and accurate spindle setups.

All heads are made in standard models with 2 to 6 spindles; however, all of the spindles in a particular head do not have to be used—for example, a 4-spindle head could be used for a 3-hole or 2-hole pattern. Minimum centers are $1^{1}/_{8}$″ and maximum bolt circles are $8^{3}/_{4}$″ in diameter.

The Quick Change Head, which may be mounted on most standard drill presses without special tools, is distributed through Strutz & Mead, Inc., Milwaukee, Wis.

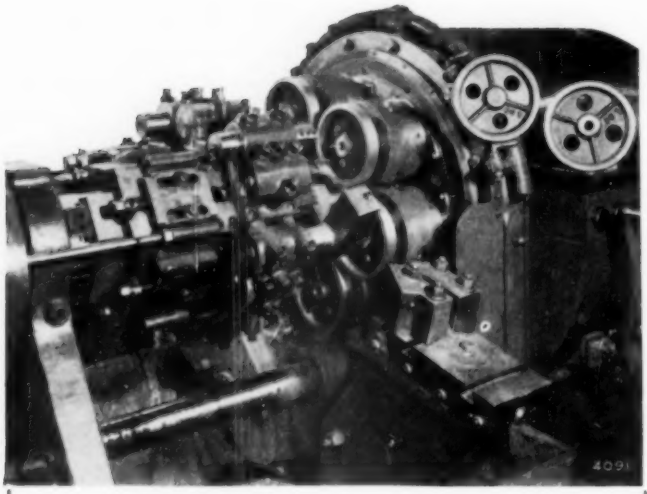


Oiltight Push-Button by G-E

A NEW LINE of oiltight **PUSH-BUTTON UNITS**, selector switches, and indicating lights, especially designed for the machine tool and automotive industries, has been announced by the Control Division of the *General Electric Company*. Protection against entrance of oil is provided throughout the line by a diaphragm seal and a rubber gasket, the latter preventing oil from creeping in along the mounting bushing, while the diaphragm keeps it from entering between the button and the main body of the unit.

The momentary-contact push-button units are available in several forms. The single-pole unit provides a normally-open and a normally-closed circuit, while the three-point unit provides two normally-open circuits with common connection. Double-pole units are also available with either normally-open or normally-closed circuits. All contacts are double-break, and made of silver.

Additional information may be had in GEA-4254A.



GEAR BLANKS ARE TURNED ACCURATELY AND SPEEDILY ON

"BAIRD" AUTOMATIC CHUCKING MACHINES

Here is shown a "Baird" No. 76H Chucking Machine, set up for turning, facing and boring gear Blanks made of a Special Cast Iron having a Rockwell hardness—85—90 B Scale.

The O.D. is finished turned to 6.800 plus or minus .001 and both faces are finished to 1.000 width, plus or minus .001.

The Hole is finished bored and reamed .750 diameter to plug gage and is concentric with the O.D. turning within .001 total indicator reading.

The work is held in Standard "Baird" Three Jaw Contracting Chucks, using stud type jaws for gripping. (The Spindle Turret is shown partially indexed to better illustrate the method of chucking.)

This gear is completely turned as shown to the required accuracy at the rate of 55 pieces per hour.

Selection of a spindle speed for each position, which is a special Baird Feature, permits high Spindle speeds in the finishing positions where carbide tools are used to produce the fine accurate surfaces required.

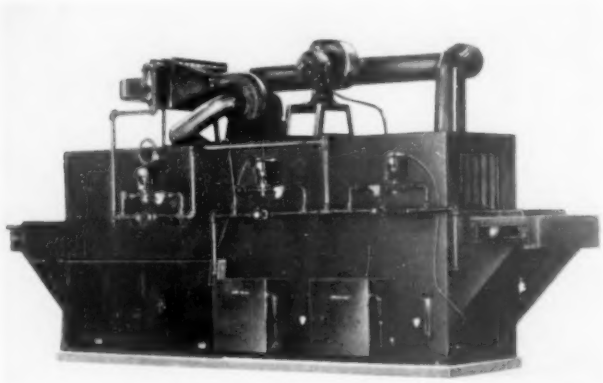
When you have Turning Operations that should be done profitably

"ASK BAIRD ABOUT IT."

THE BAIRD MACHINE COMPANY
STRATFORD, CONN.

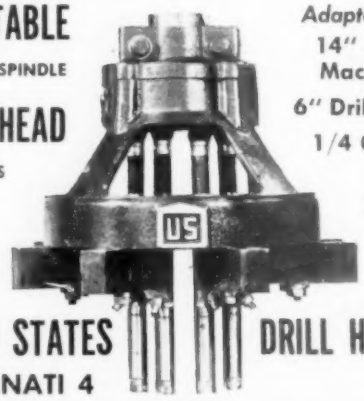
Conveyor Spray Washer

A FLAT CONVEYOR TYPE **SPRAY WASHING MACHINE**, adaptable for cleaning and similar spray operations, as well as for drying, is announced by the *Optimus Equipment Company*, 313 Church Street, Matawan, N. J., manufacturers of metal washing and drying equipment. The new machine which may be adapted to many different and difficut problems, will rapidly spray any parts which may be handled either in baskets, on racks, or simply laid on the conveyor.



Solutions are forced on the parts through a battery of spray nozzles by means of a powerful pump, and alkaline, acid, solvent type, air drying, oil spray, and many similar operations can all be handled. Any type of heating can be employed, and the machine, which features a long horizontal tunnel placed on top of a series of solution tanks, is available in all sizes with any variety of horizontal conveyor.

ADJUSTABLE
MULTIPLE SPINDLE
DRILL HEAD
8 SPINDLES



Adaptable to
14" & 17"
Machines
6" Drilling Area
1/4 Capacity
21/32
Centers

UNITED STATES DRILL HEAD CO.
CINCINNATI 4 OHIO

Pat. No. 2,089,794

- For tough stamping jobs
- Deeper impression with less exertion
- Any size character from 1/16" to 1"
- 25% to 50% more service

SAFETY
(Reg. Trade Mark)
WEDGE GRIP
LETTERS & FIGURES

- No Spalling!
- No Mushrooming!

WRITE FOR LITERATURE

Help prevent an accident today!

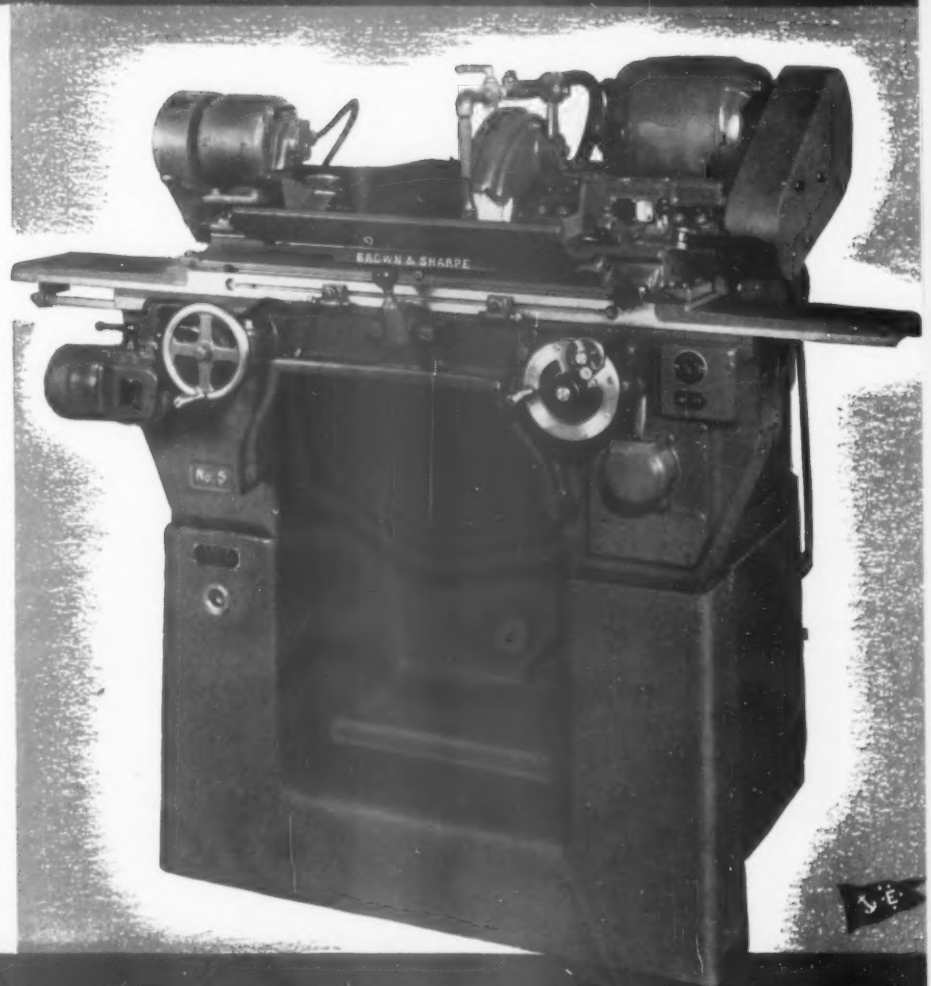
M.E. CUNNINGHAM CO.
SAFETY STEEL STAMPS

.0002" TOLERANCE
PRACTICALLY PERFECT ROUNDNESS
NO. 2 MICRO-FINISH

– this is No. 5's stated performance on grinding drum shafts – one of the most vital parts of a precision bombsight – produced in lots of 2000

SUCH ACCURACY – CONSISTENTLY REPEATED – SPEEDS SMALL PARTS PRECISION GRINDING

No. 5 Plain Grinding Machine —made in two sizes—3" x 12" or 3" x 18". Work speeds and table speeds are designed for diameters up to about 1" for greatest efficiency on high production.



B·S

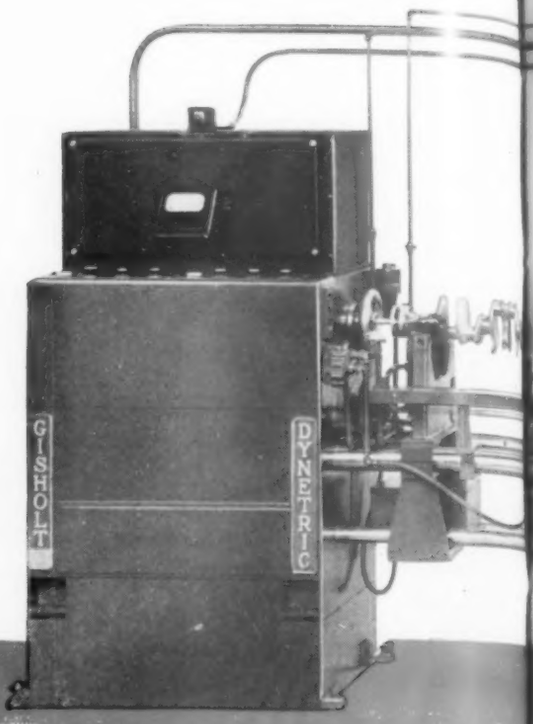
BROWN & SHARPE MFG. CO.
Providence 1, R. I., U. S. A.

BROWN & SHARPE

another history-making achievement

in DYNETRIC* BALANCING

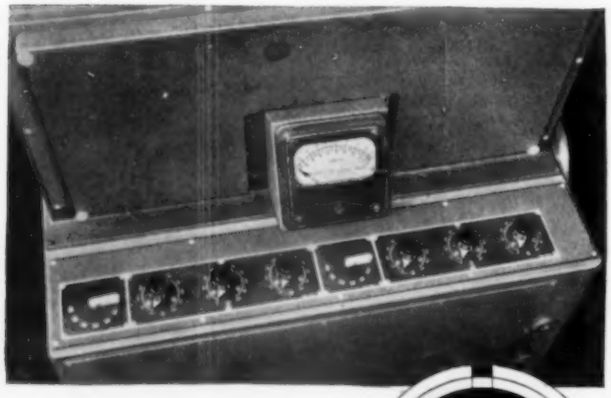
by GISHOLT



Properly defined, "balancing is a process in which the distribution of mass in a rotor is altered to eliminate vibration at the bearings supporting the rotor."

Gisholt has now developed complete semi-automatic equipment to do this—*measuring and correcting unbalance* in automotive type crankshafts—with a speed and accuracy heretofore unknown.

This new Gisholt equipment, as shown above, consists of a Type C Dynetric Balancer and a correction drilling machine, electrically connected. The Dynetric Balancer indicates directly the amount of metal to be removed from specific points in the crankshaft to produce accurate static and dynamic balance. This is done by setting six dials on the balancing machine until the indicating meter reads zero. The crankshaft is then transferred by a dolly to the correction machine and positioned in a drilling fixture.



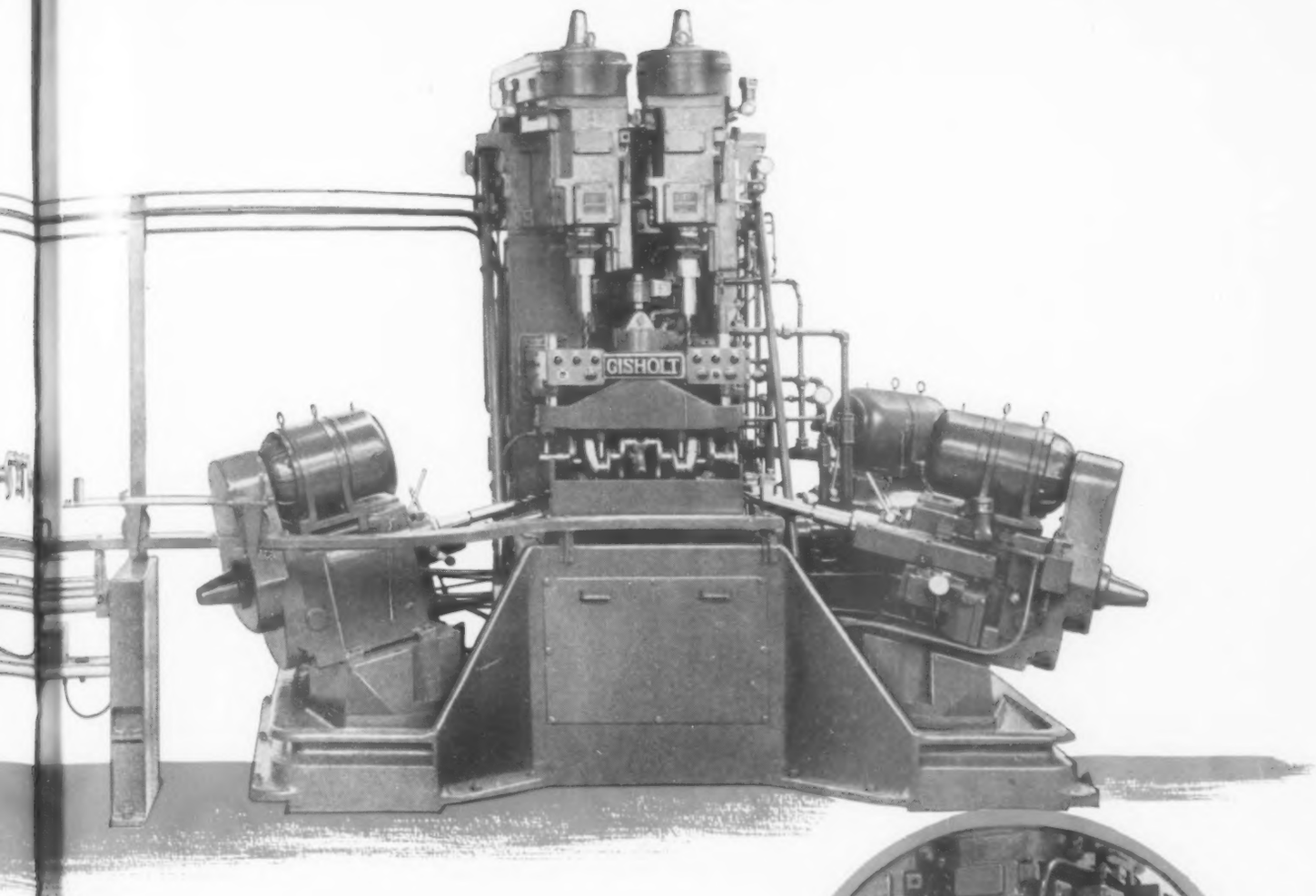
Showing the control dials and meter of the Gisholt Dynetric which measures unbalanced forces at each of six specific points on automotive crankshafts.

Correction Information Transferred Electrically

Balancing machine indications are transmitted electrically to the six-spindle drilling machine by means of self-synchronous transmitters and receivers. The depth of each hole to be drilled is automatically set from the corresponding measurement on the balancing machine. The automatic drilling cycle, started by push buttons, includes all operations such as hydraulic clamping, starting drills and flow of coolant, initiating depth measurement of each drill separately as it contacts metal, tripping into back traverse when the measured depth is reached, and returning crankshaft to position for removal.

GISHOLT

TURRET LATHES • AUTOMATIC LATHES •



Green Light Signals Operator

Within three seconds after drilling has started, a green light on the balancing machine advises the operator that the drilling information has been completely transferred so that he can proceed with the measuring of unbalance on the next crankshaft. Thus, operators of both machines work steadily with no lost time.

Time Reduced—Accuracy Increased

The average cycle for measuring and correcting unbalance is 66 seconds, determined by the time required to drill the deepest hole. Accuracy averages 0.2 ounce inches—substantially better than previous standards. And the chances for human error are reduced to a minimum.

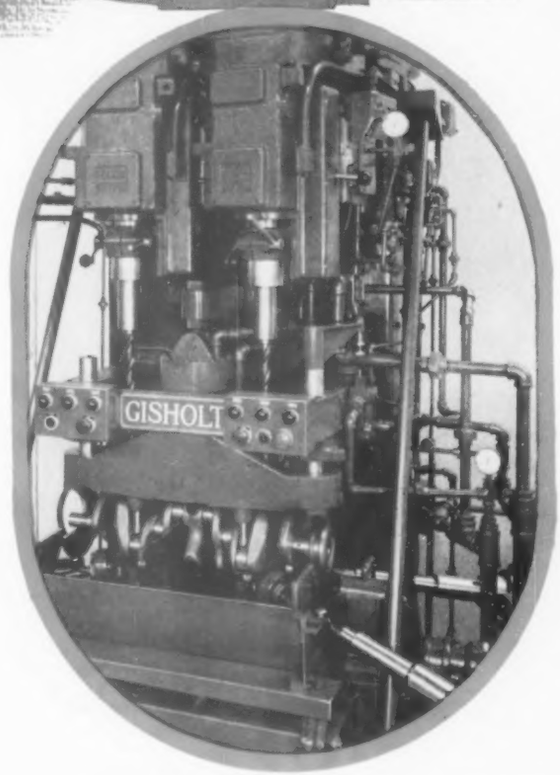
This new Gisholt equipment puts accurate balancing of crankshafts on a swift production basis, at lower cost than ever before. It is another example of Gisholt's unquestioned leadership in the field of balancing. Full information is available upon request.

** Developed jointly with the Westinghouse Electric Corporation*

GISHOLT MACHINE COMPANY

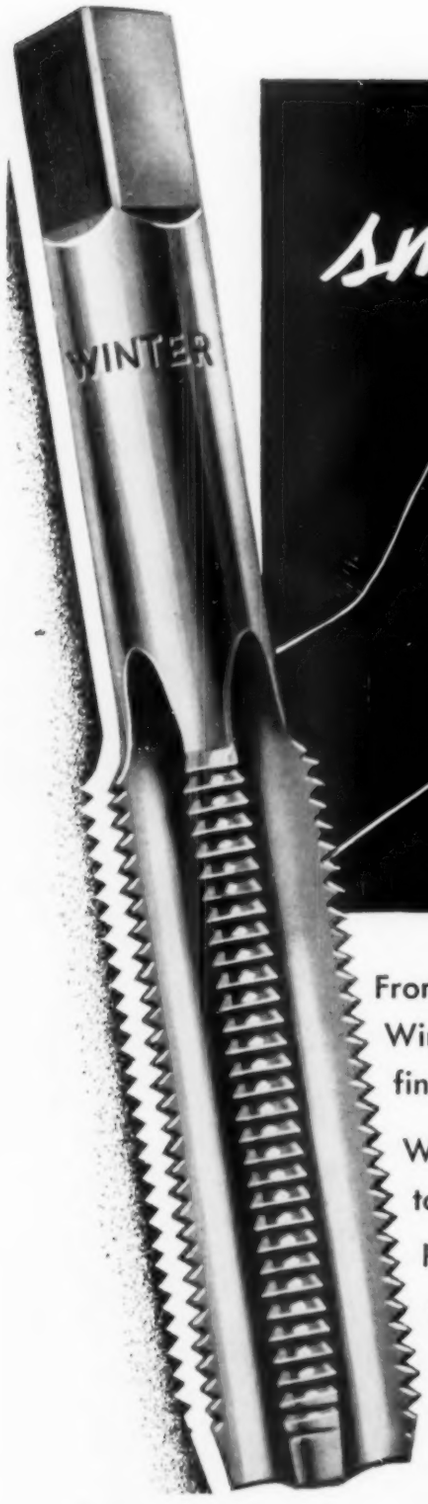
1257 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . with Gisholt



Close-up of correction drilling machine with crankshaft hydraulically clamped in position as drills advance to six points for metal removal. When any drill becomes dull, a red light automatically warns operator and remains lit until drill point is changed.

SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



small tap . . .

. . . BIG savings

From the smallest machine screw sizes to the largest taps, Winter Taps are made with that exacting precision and finish that assure smooth accurate threads at big savings.

Winter Taps — large and small — are built to handle tough production assignments as well as the finest precision work. Try them!

The broad experience of Winter field engineers particularly fits them to help you with your threading problems. Call your local Winter Distributor — your one source of complete tapping service and supply.

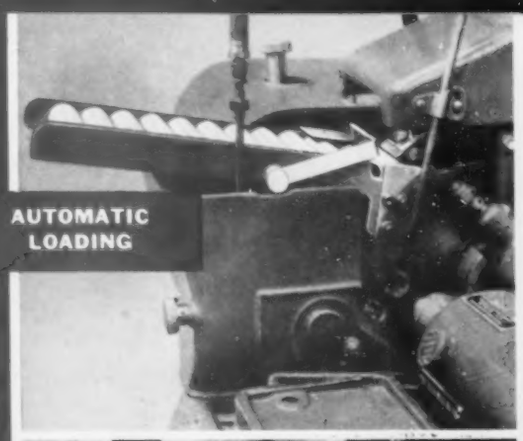
Winter Brothers

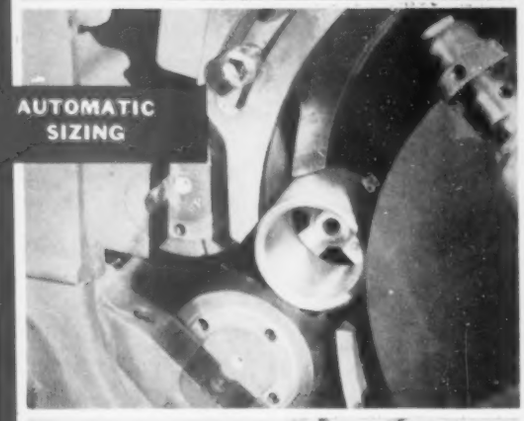
COMPANY

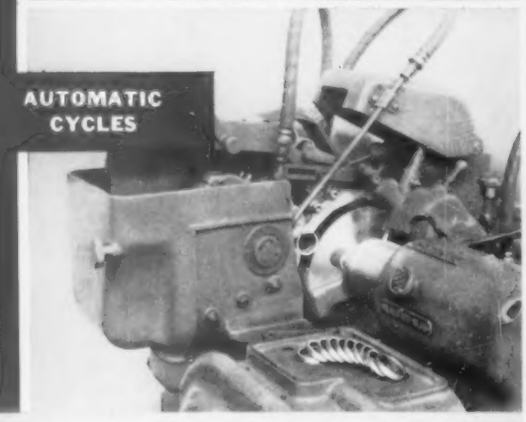
Wrentham, Massachusetts, U.S.A.

BRANCH STORES: SAN FRANCISCO, CALIFORNIA · CHICAGO, ILLINOIS · DETROIT, MICHIGAN

A DIVISION OF THE NATIONAL TWIST DRILL & TOOL CO., ROCHESTER, MICHIGAN







EVEN ACCURACY IS AUTOMATIC

with the Heald No. 81 Centerless Internal

JUST FILL the loading chute, and the Heald No. 81 Centerless does all the rest *automatically*—loading, rough and finish grinding, wheel truing, size-control, ejection — in one continuous cycle. That's why this Heald Centerless is the *only* completely automatic grinding machine. One operator—even an unskilled mechanic—can handle as many as six machines at one time . . . do it in faster preset cycles, under less strain and fatigue.

Accuracy, too, is automatic. Perfect concentricity is assured by a unique method of generating the bore from the outside diameter of the part itself. Instead of using a chuck, the work is held between three rolls in the Centerless workhead. And any type of hole can be sized to tolerances of tenths-of-thousandths—without extra gaging—by either Size-Matic or Gage-Matic controls.

Very likely you have a job that could be handled *automatically* on the Heald No. 81 Centerless — for more productive, more economical results. Write for full information to: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision
. . . less cost

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

CAMPBELL ABRASIVE CUTTING MACHINES ARE PRODUCTION MACHINES

CAMPBELL MAKES A FULL LINE OF ABRASIVE CUTTERS

Send for your copy of this file-size catalog folder. Ask for DH-1315.

Campbell machines have been developed far beyond the simple function of cutting off materials. The job shown above, for example, is but one of many in which abrasive cutting is supplanting other conventional machining methods--speeding up and economizing production. Write for detailed information.

ACCO

TRADE MARK

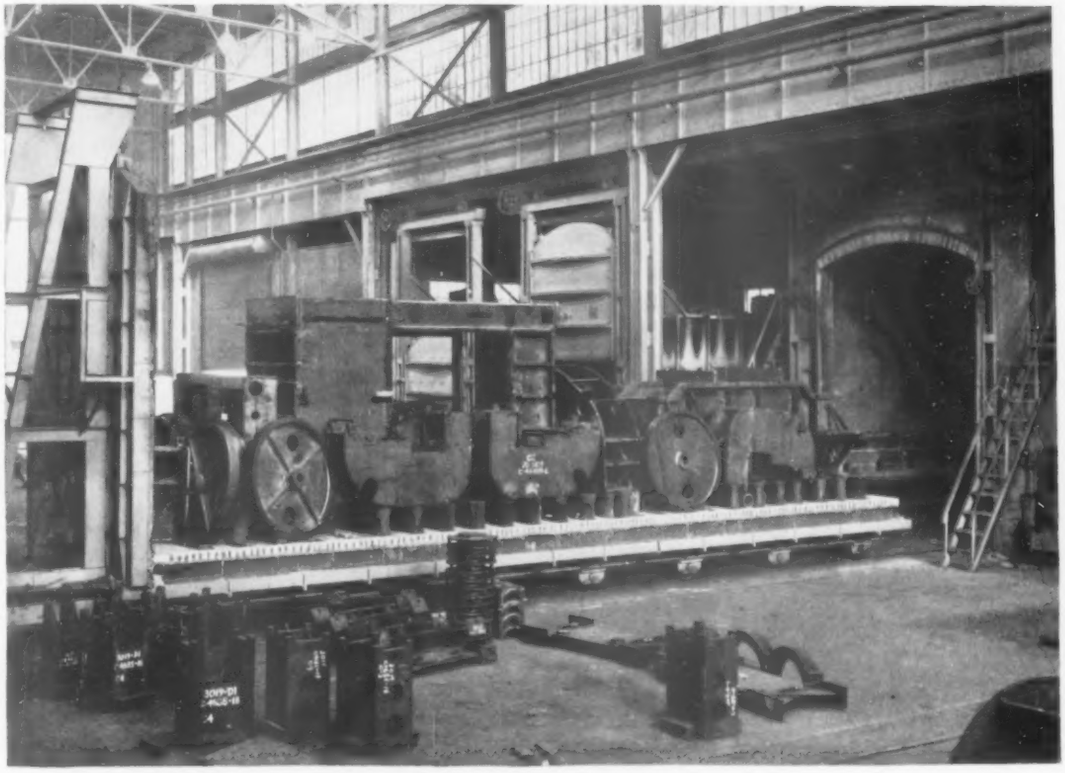
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
AMERICAN CHAIN & CABLE • BRIDGEPORT, CONN.

Warco PRESSES

WELDED STEEL PRESSES

(FULLY STRESS RELIEVED)



"Baking" Strength into the Unity of Metals

● The inherent stiffness of steel plate is 2½ times that of gray iron castings and 1½ times that of Meehanite or high test castings.

Warco press engineers have capitalized on this advantage in designing and building the advanced line of Warco welded steel presses.

In actual construction, they go even further to help assure the maximum rigidity so necessary to long die life.

All welded parts are "baked" at 1150 degrees F for a pre-determined period of time in one of our three custom built annealing furnaces, to give additional strength to the perfect union of metals in the weldments.

This stress-relieving of weldments, though a routine step in fabrication of Warco presses, is vitally important. It virtually eliminates locked up stresses that might otherwise build-up and contribute to the hazard of misalignment from overload in service.

There's a Warco press for every type of production requirement. We are in position to give prompt delivery on most standard models. Your inquiry will receive immediate attention. Consult us today.

THE WARREN CITY MANUFACTURING COMPANY

1960 Griswold Street, Warren, Ohio

A subsidiary of The Federal Machine & Welder Company • Offices in Principal Cities

ECCENTRIC GEAR PRESSES • OBI PRESSES • HYDRAULIC PRESSES • MECHANICAL PRESS BRAKES

HORN PRESSES • DOUBLE CRANK PRESSES

TOP PERFORMANCE TWINS BORN MONTHS APART

Bay State's "fractional grading" — three degrees of hardness within the usual grade — and "controlled porosity" permit micrometer adjustment in fitting the grade to the grind.

That's why you can be sure top performance will be repeated 100% by each wheel made to your original specifications — even though they are made many months apart.

There's a Bay State Wheel that will give you complete satisfaction the first time and ever after, in every type of tool and cutter sharpening. Bay State's extra-strong vitrified bond permits open structures — for cooler, faster grinding — while for other needs a wide variety of organic bonds are available. And Bay State's "Koolpore" wheels are unbeatable on high speed steels and cemented carbides.

Let us know your grinding wheel requirements. We'll send bulletins with detailed information.

BAY STATE ABRASIVE PRODUCTS CO.
2 Union Street, Westboro, Mass.
Canadian Plant: Brantford, Ontario

GRINDING WHEELS

HONING AND SUPERFINISHING STONES

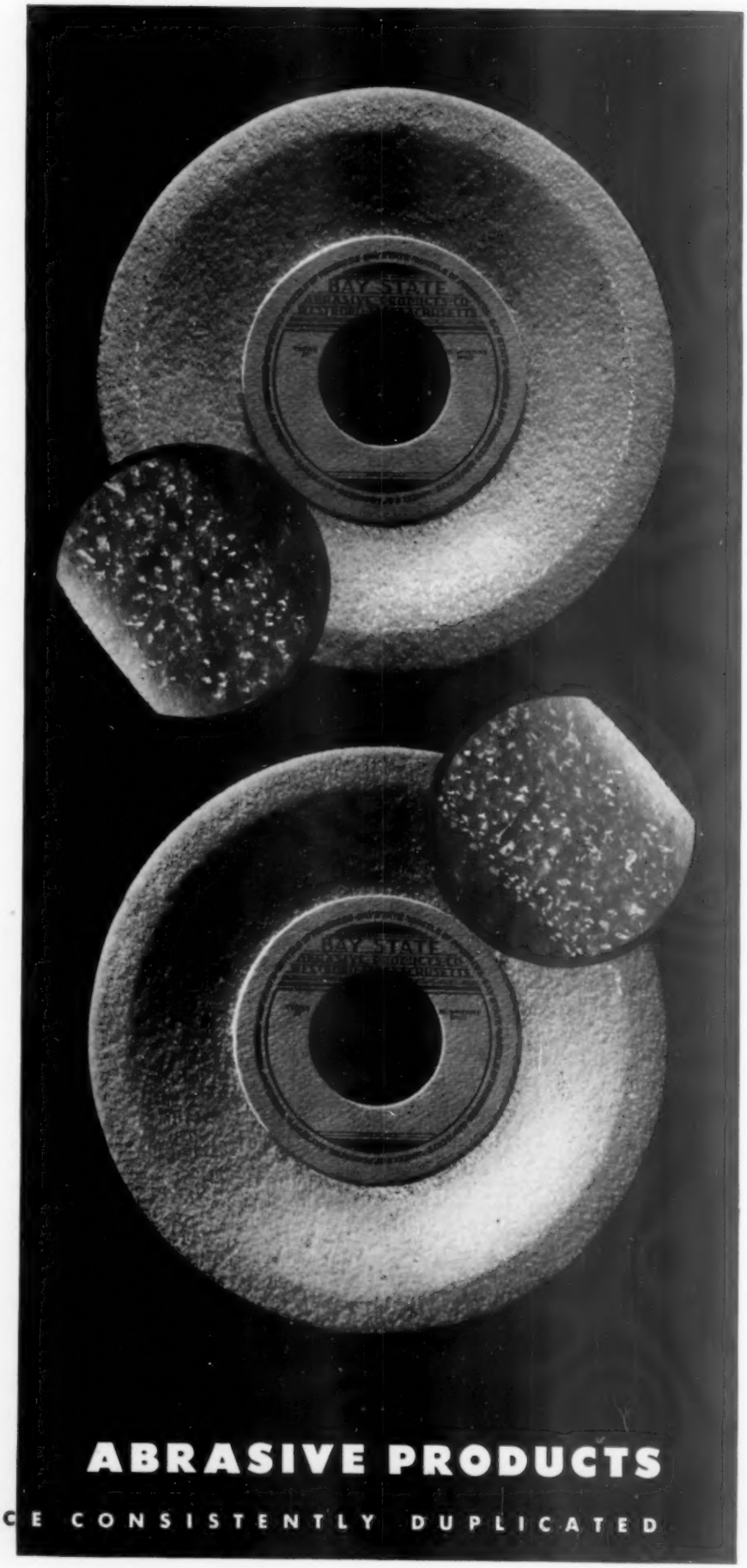
PORTABLE SNAGGING WHEELS

MOUNTED WHEELS AND POINTS

CUT-OFF WHEELS

INSERTED-NUT DISCS AND CYLINDERS

BAY STATE



ABRASIVE PRODUCTS

TOP PERFORMANCE CONSISTENTLY DUPLICATED

BETHLEHEM

Tool Steel Reference List

Bethlehem tool steels range from the straight-carbon types to the highly-alloyed, special-purpose grades so often required in modern practice.

Broadly speaking, the standard Bethlehem tool steels come under seven main headings. The following list is a general guide, and it includes the steels for almost every job in your plant:

	CLASSIFICATION	TYPE ANALYSIS	TRADE NAMES
1.	General-Purpose Tool and Die Steels *(water-quenching)*	C or C-V 0.70 to 1.40 carbon range	X; Best; XCL; Superior; XX
2.	Safe-Hardening Tool and Die Steels *(oil-quenching)*	Mn-Cr-W-V Ni-Cr-Mo	BTR Bethalloy
3.	Air-Hardening Tool and Die Steels *(air-quenching)*	Mn-Cr-Mo	AH; AH-5
4.	High-Production Tool and Die Steels	High C, High Cr	Lehigh L; Lehigh H; Lehigh S
5.	Shock-Resisting Steels	Si-Mn W Cr-V	No. 71 Alloy; Omega No. 67 Chisel Tough (H and M tempers)
6.	Hot-Work Steels	Cr-Mo W	Cr-Mo-W; Cr-Mo-V No. 57 Hot Work; No. 57 Special Hot Work
7.	High-Speed Steels	W W-Mo	Bethlehem Special High Speed; Comokut; Red Tiger (Improved) 66 High Speed; Moco; HM

Remember, our specialists are always ready to talk applications with you. Call us when tool-steel problems get tough—or better still, let us work with you from the start.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Bethlehem tool steels for every purpose

BETHLEHEM STEEL

UP TO 80% OF YOUR TURNING, FACING, AND BORING JOBS HANDLED BY

THESE 11 STANDARD CARBOLOY (TRADEMARK) CEMENTED CARBIDE TOOLS!

Reduces Inventory of "Specials" —Permits Fast Tool-Up

With these 11 Carboloy Cemented Carbide "Standards" in stock, you're prepared to handle up to 80% of your turning, facing, and boring jobs. No need to stock a big inventory of special tools—just grind "Standards" to desired shapes and you're ready to tool up fast! "Standards" stay on the job longer—hold their cutting edge longer —maintain close tolerances—yield a high output per tool—and produce a fine surface finish.

Stocked Locally For Immediate Delivery —Surprisingly Low Prices!

Carboloy "Standards" are stocked in quantity in 70 cities, coast-to-coast—making possible speedy delivery. By this service you avoid excessive delays, lost time, interrupted schedules. Moreover, these superior cutting tools are *actually priced lower than ordinary tools, in many sizes!* For complete data and specifications on all tools, write for Catalog GT-175R—sent to you without cost or obligation.

CARBOLOY COMPANY, INC.

11124 E. 8 Mile Street, Detroit 32, Michigan

CHICAGO • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES • MILWAUKEE
NEWARK • PHILADELPHIA • PITTSBURGH • THOMASTON, CONN.

STOCKED BY AUTHORIZED CARBOLOY CEMENTED CARBIDES DISTRIBUTORS IN 70 CITIES Coast To Coast

Stock up NOW on

Standard CARBOLOY* TOOLS

(TRADEMARK) CEMENTED CARBIDES

Now you can carburize selectively in liquid baths!

An example of selective carburization with "NO-KASE". Note the clear cut line of demarcation between the protected and unprotected areas. (Treated in PARK-KASE for 3 hours at 1600° F.)

Park "NO-KASE"

(Patent Applied For)

A new kind of stop-off paint

A Steel bolt selectively carburized with "NO-KASE". Note the complete lack of carbon penetration on the protected section of the bolt. (Treated in PARK-KASE for 3 hours at 1600° F.)

● Park "NO-KASE", a new development in stop-off paints provides positive protection against carburization in liquid carburizing baths. When you apply "NO-KASE" even the most difficult sections, such as threaded edges (see photograph at right) are protected from carburization.

Park's "NO-KASE" is applied as paint and is easily confined to the area where protection is desired. Because it is quick drying "NO-KASE" can be immersed in the carburizing bath approximately one hour after the part is painted.

The vehicle of "NO-KASE" paint burns out when subjected to the heat of the bath, thereby leaving the pigment as a continuous metallic coating.

SEND IN YOUR ORDER FOR "NO-KASE" TODAY OR WRITE FOR PARK BULLETIN E-16 WHICH GIVES YOU COMPLETE INFORMATION AND PRICES

Park

PARK CHEMICAL CO.

DETROIT . . . MICHIGAN

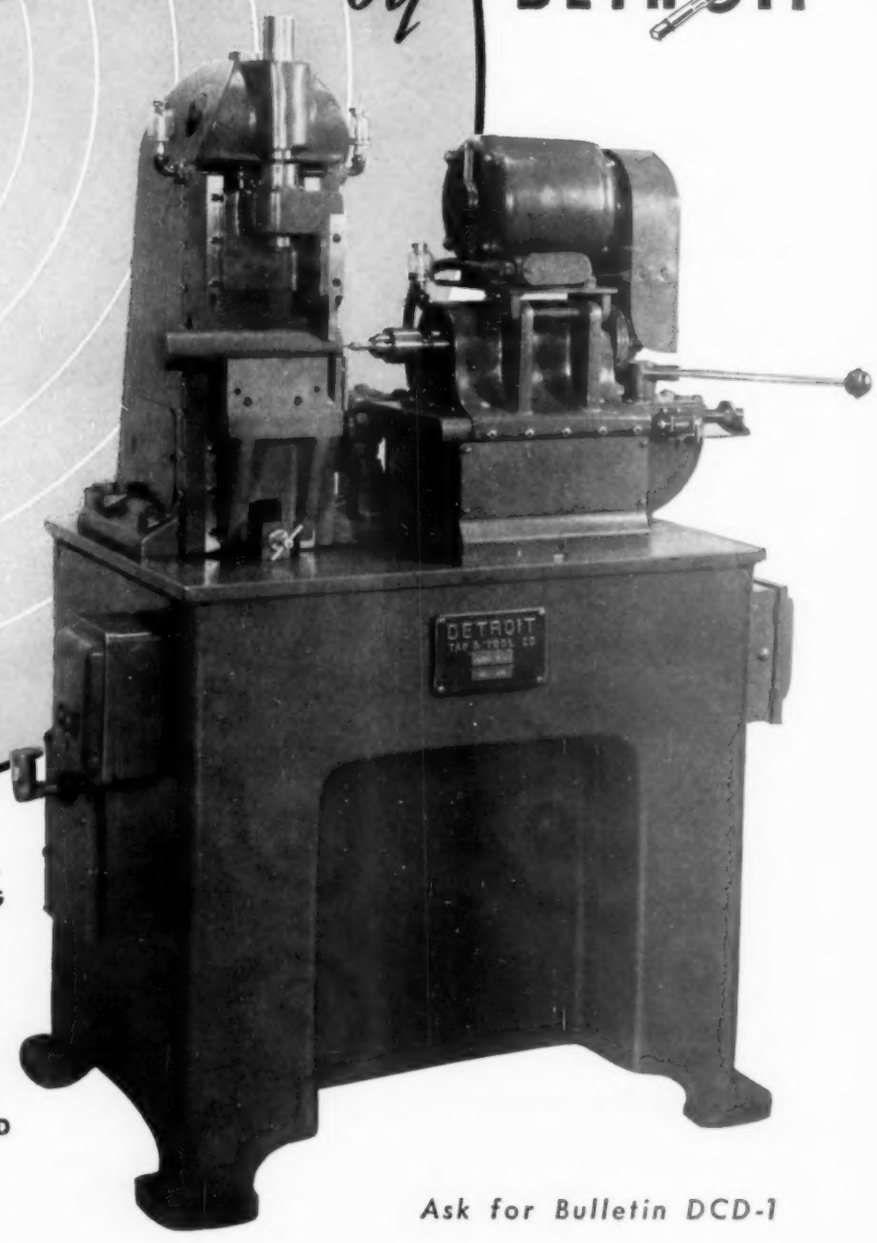
●Liquid and Solid Carburizers ☆ Cyanide, Neutral and High Speed Steel Salts ☆ Lead Pot Carbon ☆ Charcoal ☆ Coke ☆ No Carb. ☆ Carbon Preventer ☆ Quenching and Tempering Oils ☆ Drawing Salts ☆ Metal Cleaners ☆ Liquid Grain Cement

8074 MILITARY AVE. DETROIT, MICH.

Announcing

A HIGH PRODUCTION CENTER DRILLING MACHINE

by DETROIT



- AUTOMATIC POSITIONING AND CLAMPING
- SINGLE LEVER CONTROL
- MAXIMUM OUTPUT
- MINIMUM SKILL REQUIRED
- WIDE RANGE OF STOCK

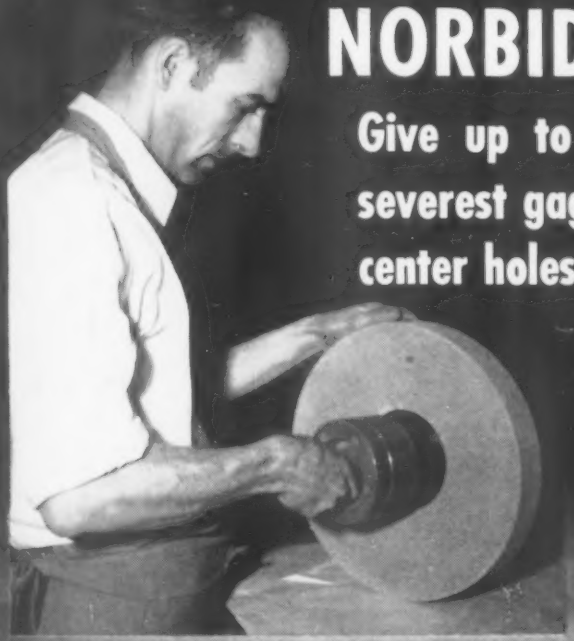
Ask for Bulletin DCD-1

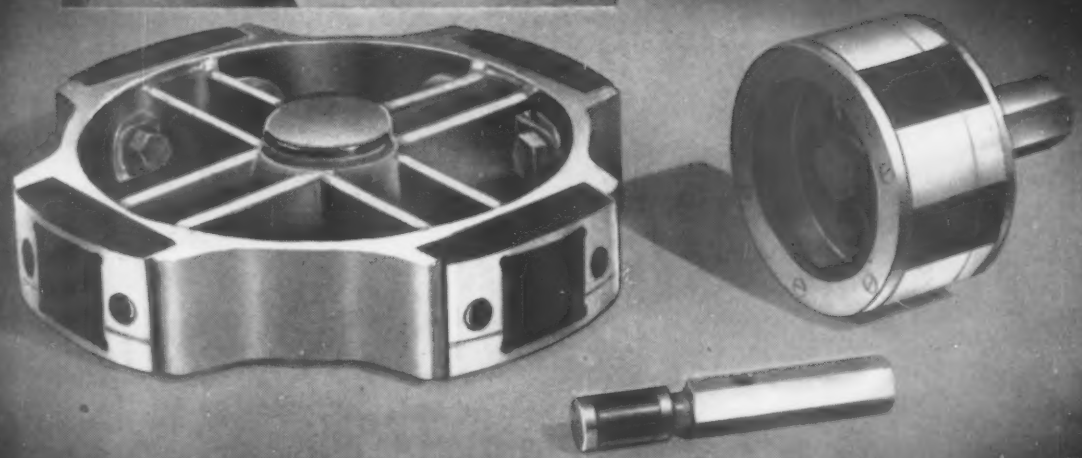
DETROIT
TAP & TOOL CO.
8432 BUTLER DETROIT 11, U.S.A.

GROUND TAPS • THREAD MILLING CUTTERS • THREAD GAGES • SPECIAL THREADING TOOLS, MACHINES AND CHECKERS

NORBIDE GAGES

Give up to 200 times longer life on severest gage-wearing job—measuring center holes in grinding wheels.





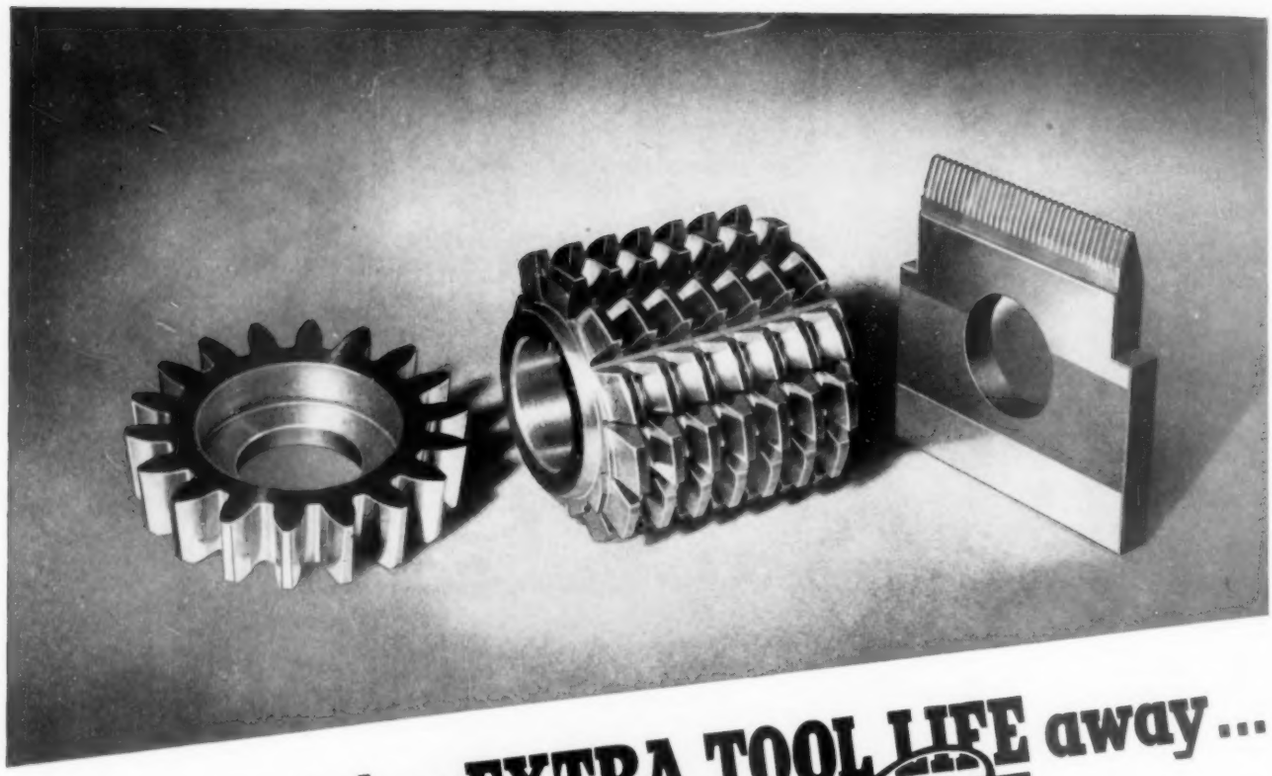
NO job could be a more severe test of the wear-resistance of gages than that of measuring center holes in grinding wheels. Not only do the hard, sharp grains of abrasive cause an abrasive action as the gage is inserted in the grinding wheel, but also the manufactured abrasives, aluminum oxide and silicon carbide, are themselves harder than many of the metals commonly used on measuring devices. Here, as in many production measuring jobs, is the place to use NORBIDE gages, manufactured of Norton Boron Carbide, the hardest material made by man. The extreme hardness of NORBIDE gages enables them to outwear many other types of gages hundreds of times and eliminates the costly, time-consuming requirement of frequently checking gages for accuracy.

NORTON COMPANY, WORCESTER 6, MASS.

NORBIDE* – The Hardest Material Made by Man

NORTON BORON CARBIDE

* *Trade-mark Reg. U. S. Pat. Off.*



We are giving EXTRA TOOL LIFE away ... . Free

That's not an idle claim. For instance, one tool engineer recently confided in us that he . . . "took one of your hobs and had another company copy it. They did—so exactly that you couldn't find the slightest difference under a comparator. The steel checked exactly as to analysis and hardness, too. But, when we put them on the job . . . not one of them did better than one-half the production of the Michigan hob!"

And remember this—

Michigan does not make just hobs or just shaper cutter or just gear cutting tools. We are interested in the gear from the forging to final assembly. That helps a lot when you are engineering gear cutting tools to any given job.

No Segregated Carbides

He is not the only one who has tried copying the design of engineered-for-the-job Michigan gear cutting tools. What they do not get is the freedom from carbide segregation in Michigan gear cutting tool steel.

Ask your metallurgist. He'll tell you that segregated carbides are points of weakness in any tool. Get rid of them and you get:

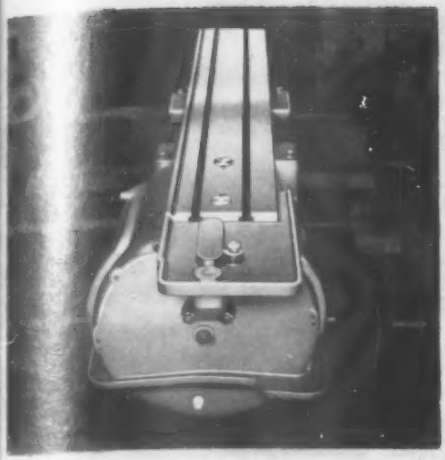
1. **Better heat treat results—stronger body and teeth—no weak spots.**
2. **Better sharpening—less chance of minute chips breaking out—less stock removal—more grinds per tool.**
3. **Smoother cutting action—no jagged edges.**
4. **More pieces per grind—cutting edges hold up longer.**

ORIGINATORS of GEAR SHAVING

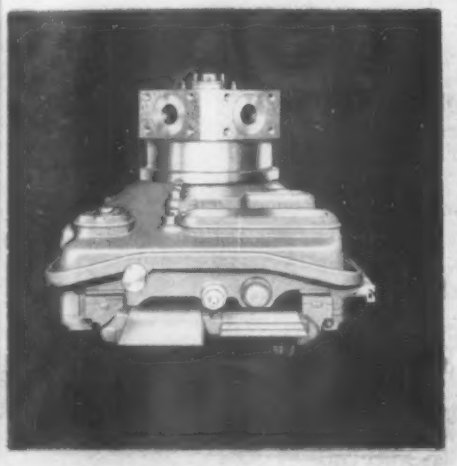
Have you seen Michigan's combined manual and catalog "Gears"? Ask for it on your company letterhead.

MICHIGAN TOOL COMPANY

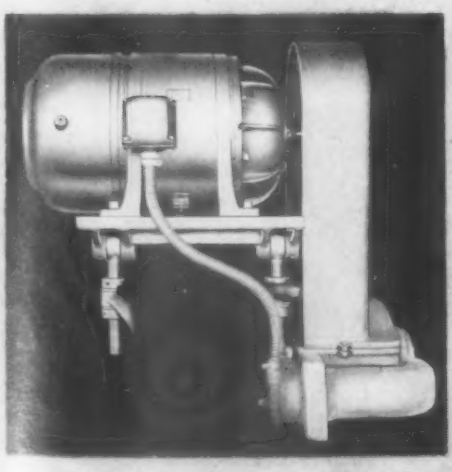
7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.



Cross Slide Unit and base are of modern design. The cross slide cam drum is located under the cross slide and the ball bearing cam roll studs are mounted in the cross slide, thus furnishing a direct connection. The cam drum is carried in a compartment at the rear, outside baseways and is readily accessible for application of special cams.



Turret Slide and Unit are of liberal proportions. Turret Slide is provided with hardened and ground steel inserts to form its bearings on base ways, which are also of hardened and ground steel. Turret is automatically clamped in position after indexing. Five turret faces are provided for mounting of tools.

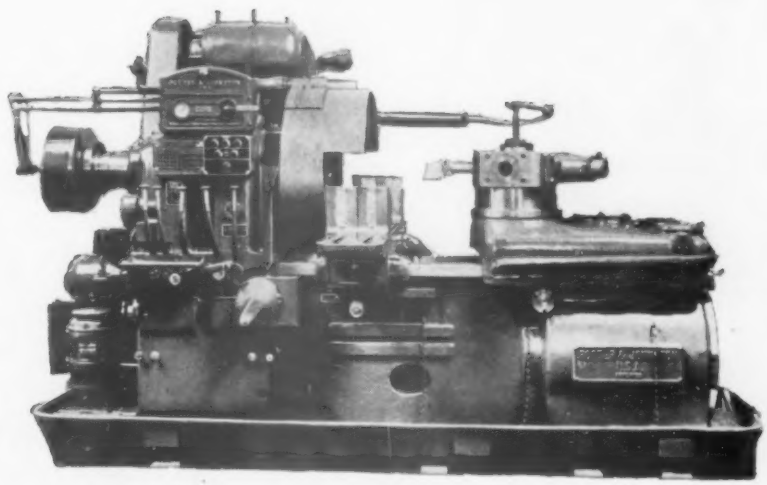


Motor Drive is provided through a special multiple V belt. A constant speed motor is mounted at rear of headstock and is equipped with a constant speed driving pulley. Another constant speed motor for driving feed motion mechanism is provided and is reversible for setting-up purposes.

P&J

6-D REL & RELX

AUTOMATICS



. . . *with time-proved features that cut production costs*

These P&J Automatic Chucking and Turning Machines . . . the product of more than forty years specialized experience . . . can be depended on to put the production of large duplicate parts in quantity on a low cost, profitable basis. The features described here are typical of P&J leadership in the design and construction of automatic chucking equipment.

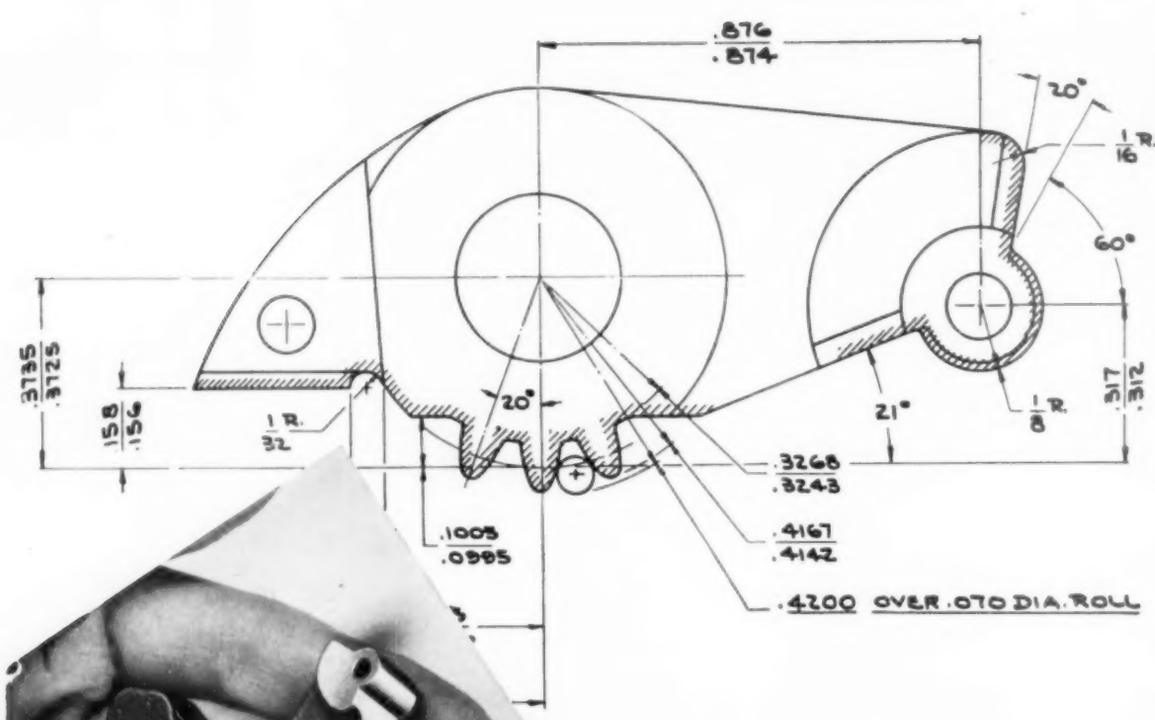
Ask for Bulletin 118 giving further details on the 6DREL P&J Automatics. Call on P&J engineers for advice and assistance on your problem of duplicate parts production.

Authorized Agent, U. S. War Assets Corporation

POTTER & JOHNSTON MACHINE CO.

Pawtucky, R. I.

Make an Extra Effort and Buy those Extra Victory Bonds Now!

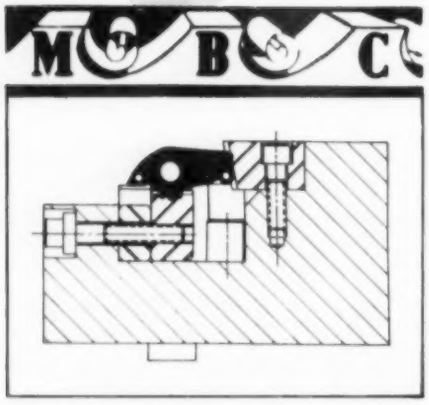


What's so different about *this* part?

Just this—The job was engineered—the tools were built and the part was machined by ONE SOURCE, MICHIGAN BROACH.

This same "*complete service*" is being performed daily for many customers and being performed at reduced costs. MICHIGAN'S "know how" in *designing, building* and *using* broaches makes this possible.

MICHIGAN, long recognized as one of the industry's most reliable sources for broaches, fixtures and gages, also operates the largest commercial machine shop of its kind in the country for *furnishing complete parts.*



Four milling operations were required to machine this contour. It was broached in one operation. Broaching is faster, reduces scrap, requires less skilled labor.

Send your next part to MICHIGAN for machining or have MICHIGAN quote on furnishing it complete.

The new NUMBER 8 folder is off the press. Write for your copy. It deals with an interesting phase of broaching.

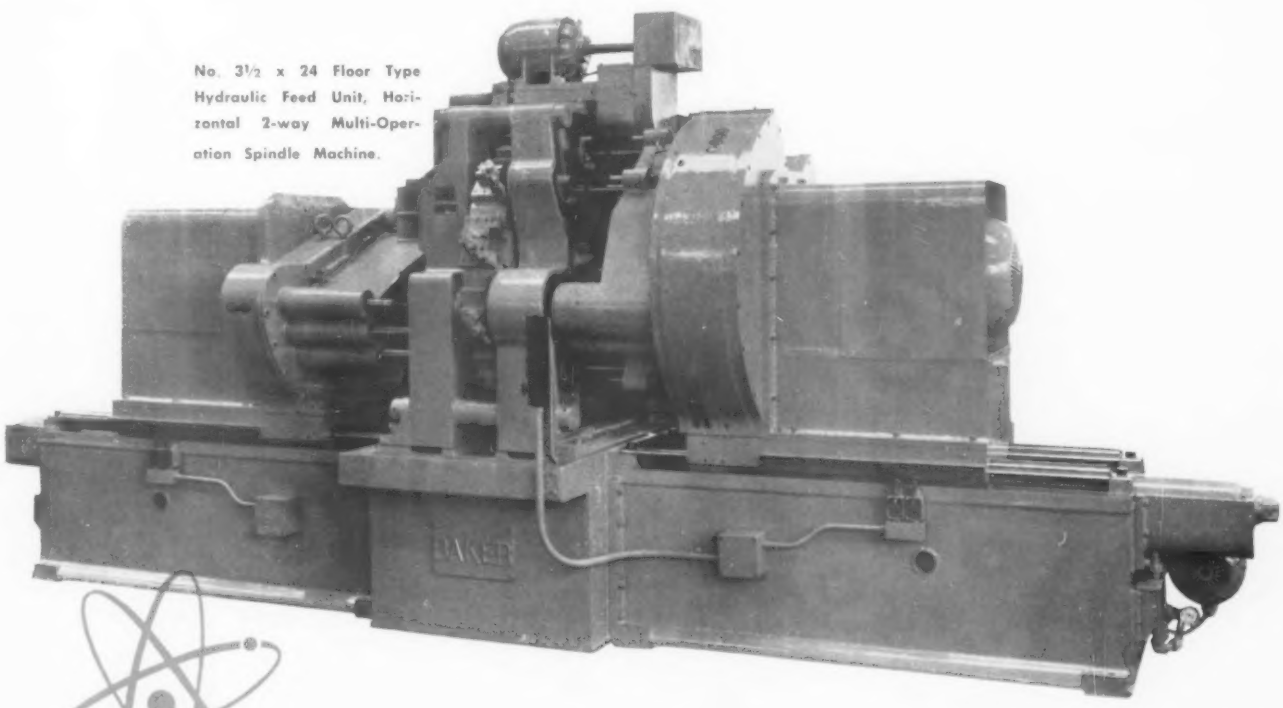
MICHIGAN BROACH CO.

10367 NORTHLAWN AVENUE **DETROIT 4, MICHIGAN**

POST WAR MANUFACTURING

requires

multi-operation machines to reduce costs and speed up production schedules. Baker Brothers specialize in heavy duty machines allowing automatic indexed multiple operations at one chucking. For instance, Model 3½ x 24 illustrated here has a 22-spindle head on the right unit and a 7-spindle head on the left. The saddles are mounted on four nitralloy bars after an original design that reduces wear decidedly. The 12-station power automatic index trunnion work-holding fixture allows load and unload at chucking position, and carries the work accurately to the 11 cutting stations. Built for extra-heavy-duty operations in alloy steel, this is a typical example of Baker engineering. For free consultation on your production problems, write or wire us today.



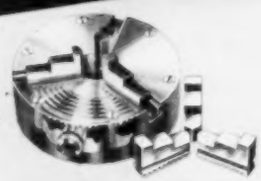
No. 3½ x 24 Floor Type Hydraulic Feed Unit, Horizontal 2-way Multi-Operation Spindle Machine.

Baker Bros. Inc. Toledo 10, Ohio

A WORLD STANDARD FOR PRECISION

No matter what your Work Holding Problem . . .
consult
CUSHMAN

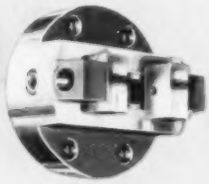
Light Duty



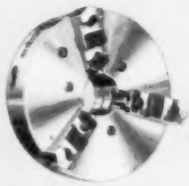
3 JAW
SELF-CENTERING

4 JAW
INDEPENDENT

Medium Duty



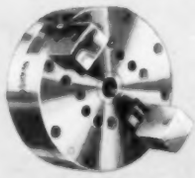
2 JAW
SELF-CENTERING



3 JAW
SELF-CENTERING

4 JAW
INDEPENDENT

Heavy Duty



2 JAW
SELF-CENTERING

3 JAW
SELF-CENTERING

4 JAW
INDEPENDENT

Extra Heavy Duty

3 JAW
SELF-CENTERING

4 JAW
INDEPENDENT

Cushman Chucks are now being made in a wider range of types, sizes and jaw specifications for mounting on American Standard Type A-1, Cam-lock Type D-1 and Long Taper Key Drive Spindle noses, as well as for use on threaded spindles, using adapter plates. We are ready to serve you to meet post war requirements on expanded production lines. The right chuck with the right jaw equipment can help you reduce machining costs. Consult us.

THE CUSHMAN CHUCK COMPANY
HARTFORD 2, CONN.

Consult
CUSHMAN

Chucking Engineers Since 1862

RIGIDITY

7.6 secs. ... for 12 varied SECOND OPERATIONS

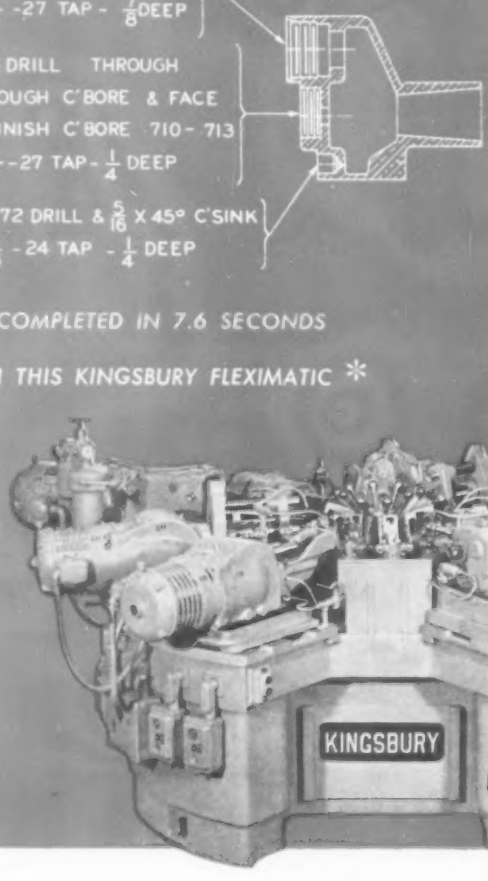
A BRONZE REGULATING VALVE

REQUIRING 12 VARIED SECOND OPERATIONS

$\frac{23}{32}$ CORE DRILL
STEP C'BORE & FACE
$\frac{7}{8}$ -27 TAP - $\frac{7}{8}$ DEEP

$\frac{1}{4}$ DRILL THROUGH
ROUGH C'BORE & FACE
FINISH C'BORE .710 - .713
$\frac{3}{4}$ -27 TAP - $\frac{1}{4}$ DEEP

.272 DRILL & $\frac{5}{16}$ X 45° C'SINK
$\frac{5}{16}$ -24 TAP - $\frac{1}{4}$ DEEP



IS COMPLETED IN 7.6 SECONDS

ON THIS KINGSBURY FLEXIMATIC *

Twelve machining operations, including drilling, tapping, facing, counterboring, and countersinking, are completed on the illustrated bronze regulating valve *in 7.6 seconds.* The *Kingsbury Fleximatic* that does this complex, high production job is made up of 9 *standard* Kingsbury metal-cutting units mounted on a *standard* Kingsbury base. The Fleximatic is run by a single operator. He merely loads and unloads the special work holders of the automatically indexing turrets as they appear at his station. The machining operations are performed successively and automatically as the turret indexes.

The Fleximatic method is based on the use of standard units and modern engineering skill. Kingsbury experts study the production problem, then assemble the units in the most practical manner to produce at the most efficient rate. Such combined machining operations result in greater production and lower unit costs. And, the first cost is much lower than the usual special-purpose machine.

Do you have a production problem involving multiple machining operations? Send drawings and production data. Let our engineers suggest a profitable solution.

WE PUT OUR HEADS TOGETHER TO CUT YOUR DRILLING COSTS

KINGSBURY
MACHINE TOOL CORP.
KEENE, NEW HAMPSHIRE

Write for Bulletin **G**

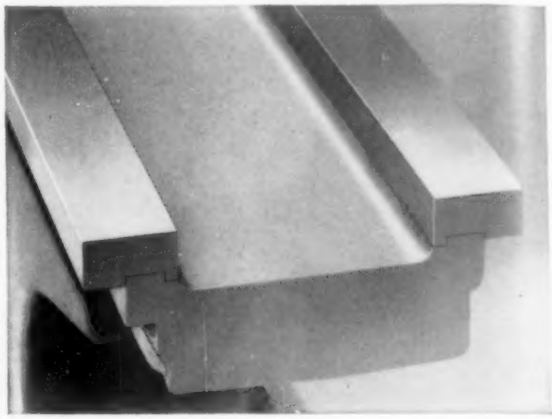
*** KINGSBURY FLEXIMATIC**

—a special purpose machine for combined automatic operations during a single chucking —the result of Kingsbury engineering ability in the use of low cost *standard* Kingsbury drilling and tapping heads on *standard* Kingsbury bases.

how **RIGIDITY** preserves **ACCURACY**

Above: *Bed and Headstock are cast integrally to form an extremely heavy unit and to provide the rigid foundation for all types of work.*

Below: *Solid block type ways are straddle keyed to the bed and ground in perfect alignment with the spindle. All working surfaces are hardened to 64-66 Rockwell "C".*



Here are two good reasons why you can count on the accuracy of Gisholt Turret Lathes—now and years from now.

One-piece bed and headstock, cast as a heavy, rigid unit, reduce distortion and vibration to a minimum. Headstock is jig-bored to insure—and *maintain*—perfect alignment of spindle and drive shafts, with ample metal to provide the most solid support possible.

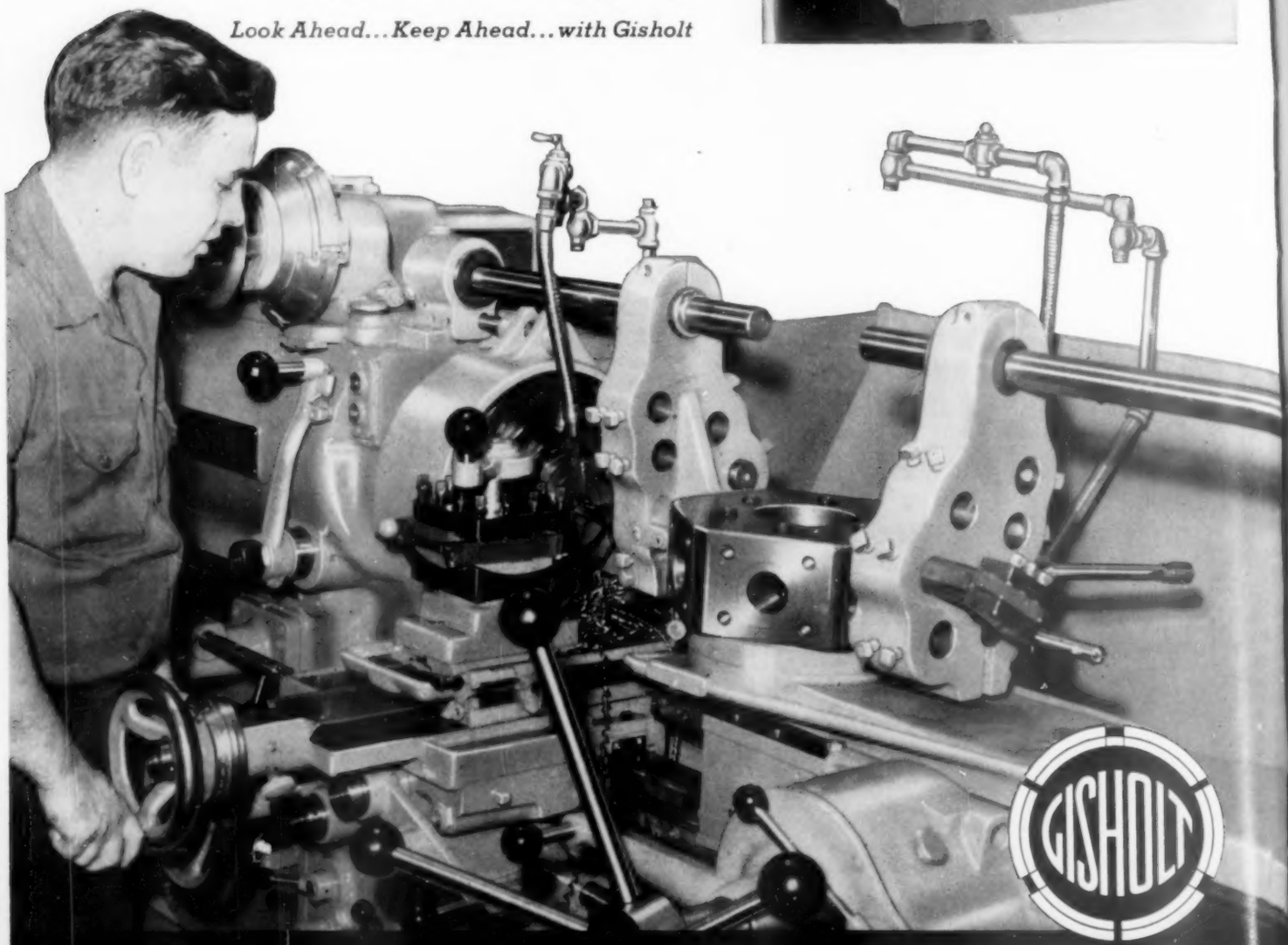
Hardened steel ways are augmented by hardened steel strips secured to the ram saddle, as well as hardened steel gibs and clamps, making an assembly that is virtually wear-proof. Its accuracy is further preserved by force lubrication.

These advantages are yours for the long life of any Gisholt Turret Lathe. Ask for complete details.

GISHOLT MACHINE COMPANY

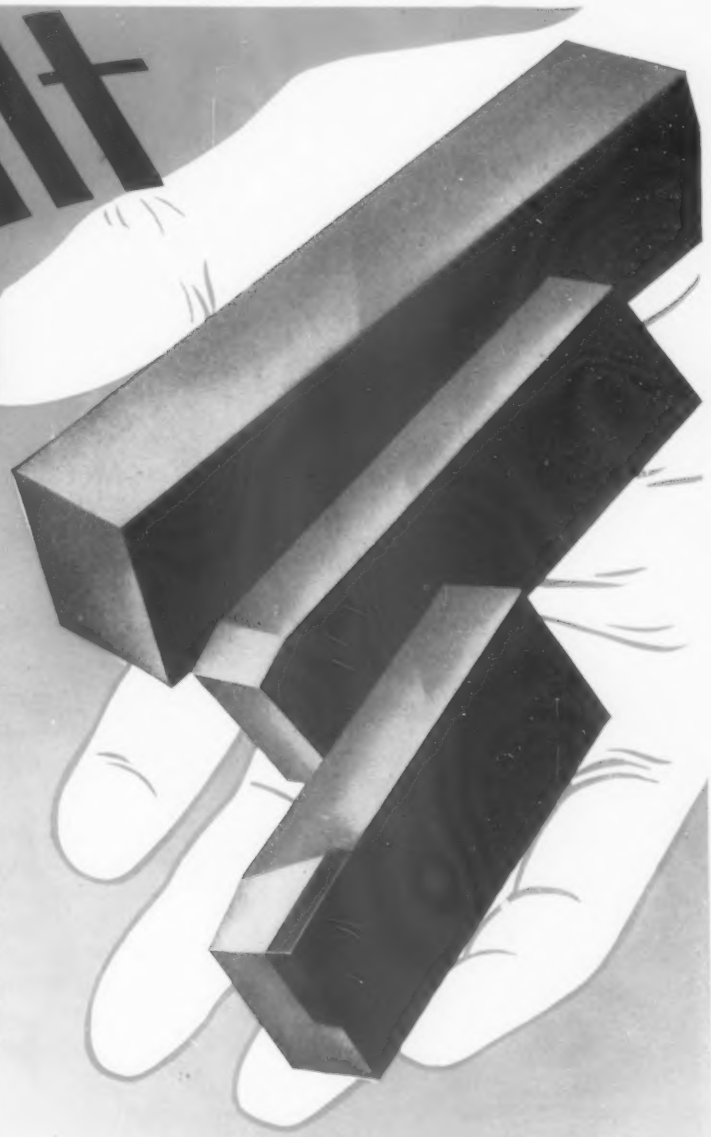
1257 E. Washington Ave. • Madison 3, Wis.

Look Ahead... Keep Ahead... with Gisholt



TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Crobalt Quality



Crobalt is a hard alloy (containing principally chromium, cobalt, tungsten, vanadium, zirconium and carbon), cast in the form of tool bits and inserted milling cutter blades especially developed for high speed production. At high temperatures (up to 2000 degrees) Crobalt cutting qualities remain constant.

The cutting edges of a Crobalt tool stay sharp longer, and thus assure you of much greater tool life between grinds. This automatically increases production by reducing "Down-time" ordinarily required for changing of tools. Try Crobalt in your shop.

CARBIDE TIPPED
Inserted Milling Cutter Blades

Crobalt now fabricates carbide tipped inserted milling cutter blades. Any make of tungsten carbide can be furnished. Prices for this type of blade are unusually low and the product and finish are unexcelled. We manufacture blades of all types and sizes. Send us your prints for quotation.

Crobalt Inc.

1351 N. Main St. Ann Arbor, Mich.

85% *Reduction in* GAGE COSTS

No. of Holes Gaged	Cost of Regular AGD Unplated Plug Gages	Cost of Reversible Chrome Plated Size Control Plug Gages
10,000	10 @ $10.00 Total $100.00	1 @ $15.00 Total $15.00

Figures based on 1000 holes per regular AGD unplated gage before end worn undersize. Size Control Chrome Plated Reversible Plug Ends give 10 times that service.

SAVE WITH SIZE CONTROL REVERSIBLE PLUG GAGES

Reduced plug replacement costs . . . reduced possibilities for passing sub-standard parts—you save two ways with these longer-lasting, Size Control Gages. Available in plain or plated steel or Stellite, Norbide, Kennametal, and Sapphire. Send for Catalog 47 which also describes other precision gages.

Reversible Plugs—plain or threaded they reverse quickly in pin-vise handle to give double service. Worn tips can be cut off at each end and new section exposed for six-fold service.

Entire Plug Surface Usable—straight, untapered pieces provide uniform gaging surface over entire length—finished to 1½ micro-inches or less for minimum wear.

Pin-Vise Aluminum Handle—positive locking; plugs can't slip. Easily loosened for replacing or reversing plugs—plug length adjustable for different hole depths.

2 Gages in 1—double end saves time in all gaging operations. "GO" end green finish; "NO-GO," red, for fast, easy recognition.

PRECISION PLUS PRODUCTION WITH CENTERLESS LAPPING

Size Control's new Centerless Lapping Machine gives a precision finish of 2 micro inches or less to cylindrical parts. Requires no special operating skill—piece is simply placed between lapping rolls. No costly set-ups or special tools — handles diameters from .010" to 10.00" with speedy adjustment of roller spacing. Send for Catalog 47.

OTHER SIZE CONTROL CO. Extra Values!

(1) Truncated Set Plugs—give greater value.
(2) Ring Gages root relieved on major diameters permit more resets.
(3) Carbide and Chrome Gages and Measuring Wires.
(4) Master Gage Tracing Sheets—send for this unique new drafting room time saver—free!

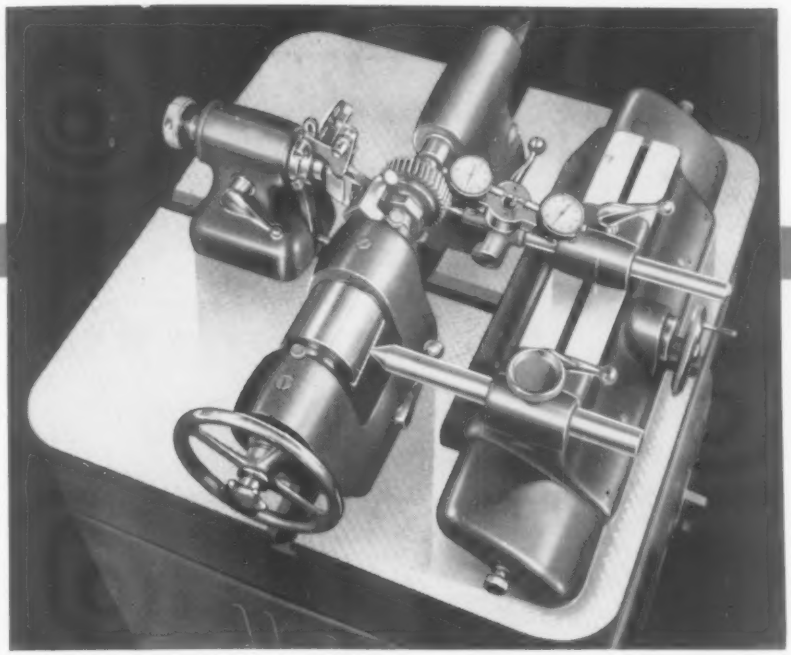
Phone Monroe 6710

SIZE CONTROL COMPANY

MAKERS OF PLAIN AND THREADED PLUG GAGES—GAGE SETS—DRILL SETS—FRACTIONAL SETS—THREAD WIRES—GEAR WIRES

Plant 2514 W. Washington Blvd., Chicago (12). Offices in Buffalo, Jamestown, Binghamton, Elmira, Rochester, Syracuse and New York City, Milwaukee, Detroit, Minneapolis, Cleveland, Indianapolis, St. Louis, Philadelphia, Boston, Pittsburgh, Los Angeles, San Francisco, Baltimore, Kansas City, Houston, Seattle, and Greenwich, Conn.

Division of
AMERICAN MACHINE & GAGE COMPANY
SIZE CONTROL CO. Precision Gages
WALSH PRESS AND DIE CO. Punch Presses
WACKER SALES DIVISION Precision Inspection Equipment



Check GEAR TEETH for DIMENSIONAL ACCURACY

The Red Ring Universal Gear Checker is an instrument for quickly and accurately checking the dimensional errors of both spur and helical gear teeth—such errors as index, helical angle, lead, parallelism, tooth size, eccentricity, interference and wobble.

The various heads used on this instrument are so ingeniously designed that the human error in their use is practically eliminated. Consequently, the average shop man can inspect gears quickly and accurately. It doesn't require a skilled inspector.

CAPACITIES OF RED RING GEAR CHECKERS:

12″ for gears ¼″ to 12-11/16″ O. D. • 18″ for gears 2″ to 18-⅞″ O. D.
24″ for gears 3″ to 25-½″ O. D.

Alterations can be made for special applications

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN RED RING ◯ PRODUCTS DETROIT 13, MICH.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

"FRAY" MICROMETER OFFSET BORING HEADS

These Offset Boring Heads are manufactured in two sizes—the FRAY Standard, which has a body diameter of 3", No. 7 or No. 9 B & S, No. 2 or No. 3 Morse, and the FRAY Junior with a 2" body diameter, ½" straight shank only.

FRAY Offset Boring Heads are made by expert toolmakers for the use of toolmakers, and have established an enviable record for their ruggedness and accuracy.

Immediately available from your jobber's stock.

NATIONAL DISTRIBUTORS

H. LEACH MACHINERY CO.

387 CHARLES ST. PROVIDENCE 4, R. I.

AGENTS IN ALL PRINCIPAL CITIES

For further information write Dept. H

IN AN ENGINEERING DEPARTMENT ORGANIZED

To Better Serve You.

Every broach, because it is designed to do a specific job, is fully dependent upon sound engineering for successful operation. The proven ability of Detroit Broach engineers is assurance to you that their tooling will do the job accurately and economically.

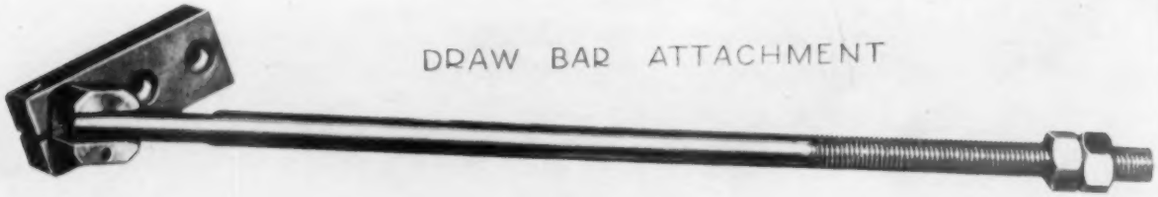
The engineering staff at Detroit Broach Company devotes its efforts to the design of broaches and broaching fixtures exclusively. These men are qualified to solve the most difficult of broaching problems—and doing so, have developed some of the great advancements in broaching application and technique.

Consult Detroit Broach regarding *your* broaching problems. This dependable service is available to you everywhere in the United States through Detroit Broach representatives who will give prompt attention to your every requirement.

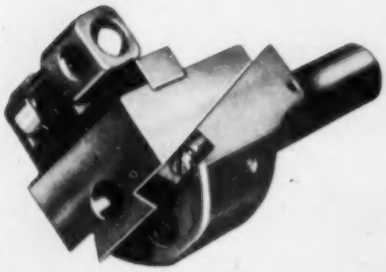
MEMBER BROACHING TOOL INSTITUTE

DETROIT *Broach* COMPANY

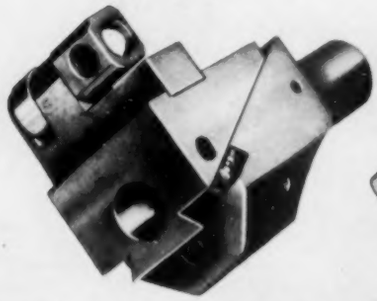
20201 SHERWOOD AVENUE • DETROIT 12, MICHIGAN



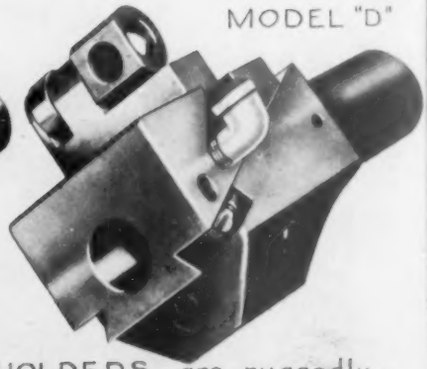
MODEL "B"

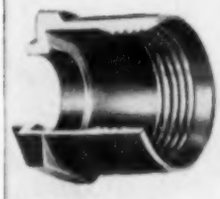


MODEL "C"



MODEL "D"





SLITTERS' RECESS TOOL HOLDERS are ruggedly built for wide and accurate recessing on automatic screw machines, hand screw machines and turret lathes. They are hardened and ground throughout except shank, with tapered gib adjustment for wear. Made in three sizes. For further information, write for bulletin.

SLITTERS'

SHAVING TOOL HOLDERS

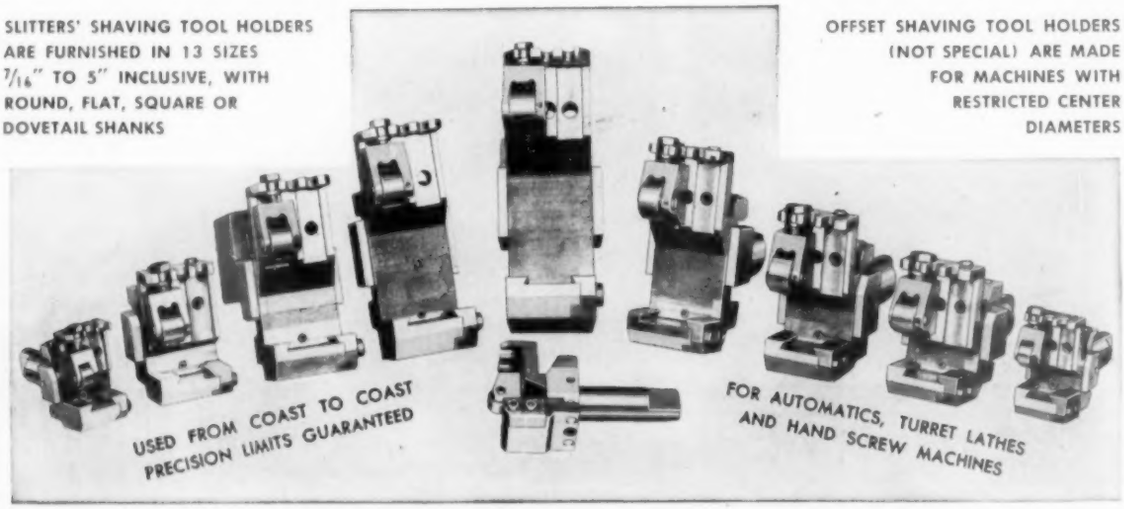
NEW IMPROVED TYPES

LOOSE JAW—FOR EASY TOOL REMOVAL AND TO TAKE-UP VARIANCE IN SIZES

20% STRONGER

SLITTERS' SHAVING TOOL HOLDERS ARE FURNISHED IN 13 SIZES 7/16" TO 5" INCLUSIVE, WITH ROUND, FLAT, SQUARE OR DOVETAIL SHANKS

OFFSET SHAVING TOOL HOLDERS (NOT SPECIAL) ARE MADE FOR MACHINES WITH RESTRICTED CENTER DIAMETERS



USED FROM COAST TO COAST PRECISION LIMITS GUARANTEED

FOR AUTOMATICS, TURRET LATHES AND HAND SCREW MACHINES

SCREW MACHINE TOOL COMPANY

3365-73 GRATIOT AVENUE DETROIT 7, MICHIGAN

MANUFACTURERS OF ACCESSORY TOOLS FOR ALL TYPES OF AUTOMATIC SCREW MACHINES

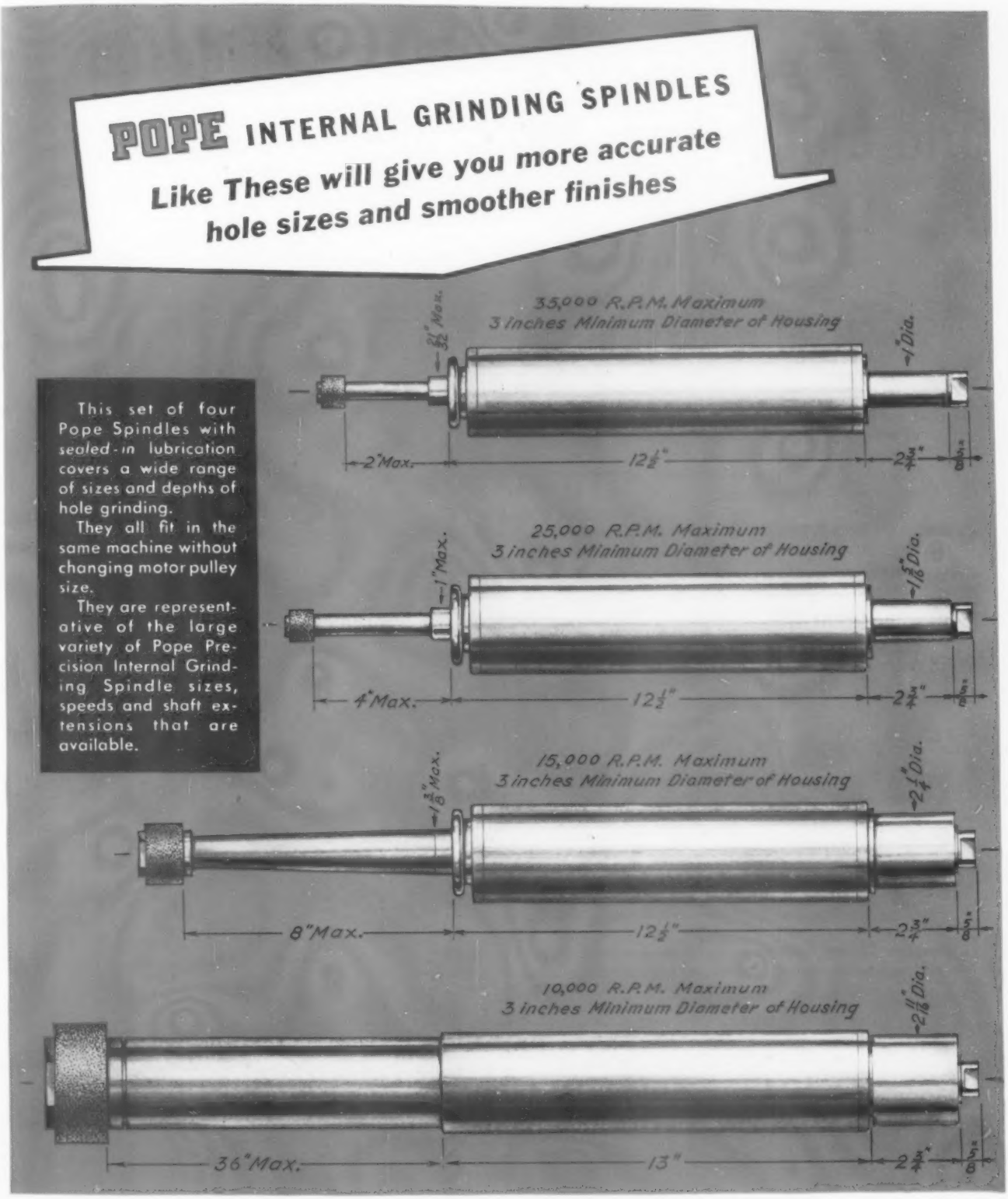
POPE INTERNAL GRINDING SPINDLES

Like These will give you more accurate hole sizes and smoother finishes

This set of four Pope Spindles with *sealed-in* lubrication covers a wide range of sizes and depths of hole grinding.

They all fit in the same machine without changing motor pulley size.

They are representative of the large variety of Pope Precision Internal Grinding Spindle sizes, speeds and shaft extensions that are available.



Ask For Internal Grinding Spindle Catalog No. J6

No. 37

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET · HAVERHILL, MASSACHUSETTS

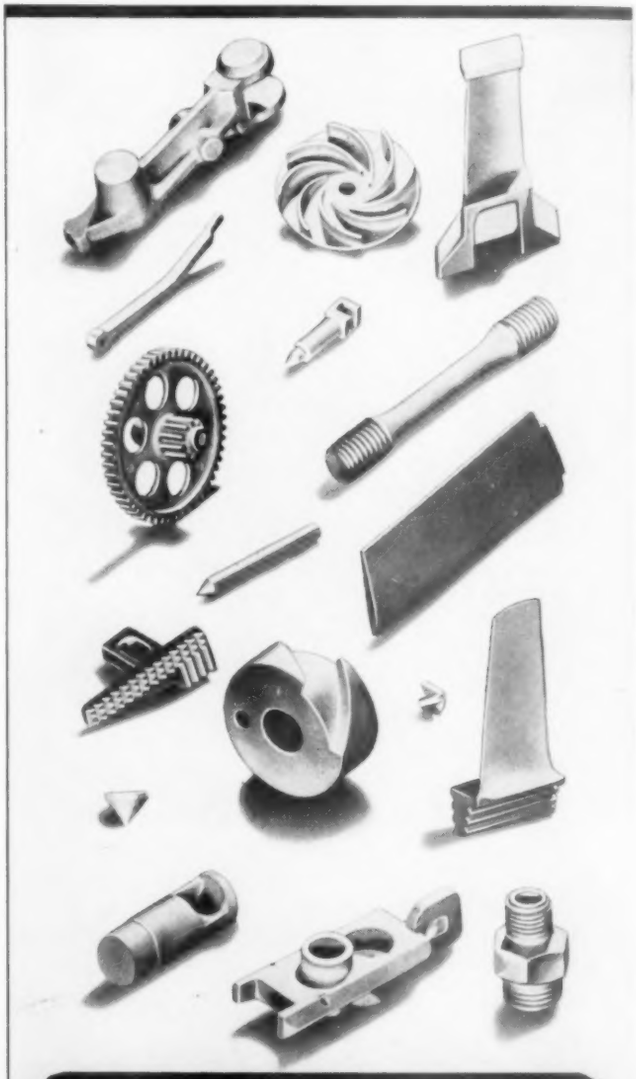
BUILDERS OF PRECISION SPINDLES

Many difficult problems of design and fabrication have been solved by HAYNES

PRECISION CASTINGS

1. **Quality Alloys** having an unusual combination of properties can be readily precision-cast. Parts cast from HAYNES STELLITE alloy, HASTELLOY alloy, and various stainless steels are now available.
2. **Small or Mass-Production Quantities** of shapes difficult to obtain by other methods of manufacture at reasonable prices can be produced by precision casting.
3. **Improved Designs** result because parts can be engineered for performance rather than convenience of fabrication.
4. **Interchangeability of Parts** is assured, because HAYNES precision castings are uniform in quality, size, contour, and finish.
5. **Intricate Shapes,** contours, and thin edges are consistently reproduced. Internal and external threads, shoulders, and cored holes can be produced.
6. **Improved Metallurgical Properties** and sound, dense castings mean long life of stressed parts operating at high temperatures.
7. **Smoother, Cleaner Surfaces** than those generally obtained by conventional casting methods are possible.

For more complete information, write for the booklet, "HAYNES Precision Castings."



Here Are Some Samples of HAYNES Precision Castings in Use Today.

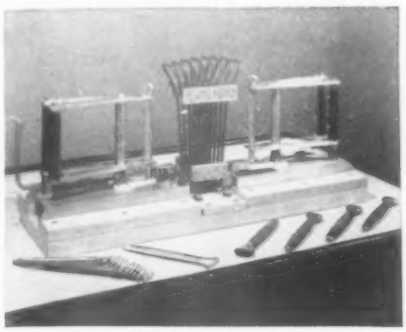
Haynes Stellite Company
Unit of Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Chicago—Cleveland—Detroit—Houston—Los Angeles—New York—San Francisco—Tulsa

The registered trade-marks "Haynes," "Haynes Stellite," and "Hastelloy" distinguish products of Haynes Stellite Company.

HAYNES
TRADE-MARK
alloys

HIGH-FREQUENCY HEATING with LEPEL *Spark-Gap* CONVERTERS

No. 3



JOINING BRASS STAMPINGS 5 TIMES FASTER

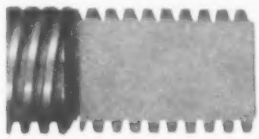
The two halves of handles for vanity mirrors were being joined by flame heating, using a silver alloy. The operation was becoming a bottle-neck — one *skilled operator* could complete less than 400 per day.

Lepel Laboratories developed this jig and heating coil for use with a spark-gap converter. Handles are now produced with less discoloration; joints are always uniform. Cleaning is appreciably reduced and rejects are eliminated. Cool, clean working conditions greatly improved the operation. Outstanding feature: with a single 15-kw Lepel unit and two jigs and coils, one *unskilled operator* produces 240 handles *per hour.*

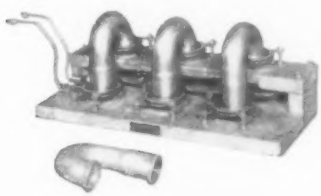
4 HOURS GRINDING TIME SAVED BY INDUCTION-HARDENING LEAD SCREWS

Before induction hardening was tried, a large machine-tool manufacturer ground the threads of 1⅝-in. diameter lead screws from bars already hardened to 47-49 Rockwell C. This was necessary to avoid lead elongation in conventional heat treating. Grinding time was seven hours.

Now progressive induction heating, with Lepel equipment, is used to harden threads, only, as shown in etched cut-away. Service

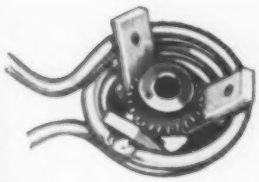


life is improved by the 55 to 60 Rockwell C hardness obtained on thread surfaces. Ductility is maintained at the thread roots. Threads are cut before hardening; average lead elongation of .0027 in. in a 42-in. screw is easily corrected by a quick finish grind. Machining time is now two to three hours.

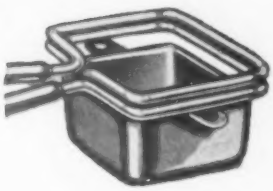


6 JOINTS SOLDERED EVERY 24 SECONDS

Soldering threaded connectors to brass elbows is an ideal job for a Lepel Induction Heating Unit. With a 15-kw unit, three complete elbows — six joints — can be soldered in 24 seconds. With two jigs and load coils, operation can be continuous, producing 450 elbows per hour. Discoloration is eliminated. High-frequency heating is not only faster and requires no skilled labor — it is cleaner, cooler, eliminates fire hazard and requires less space.

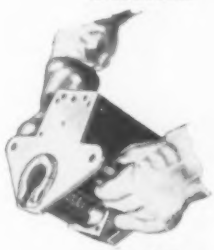


HARDEN

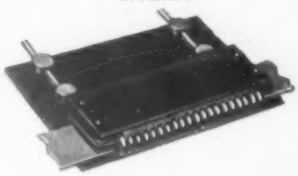


SOLDER

BRAZE



MELT



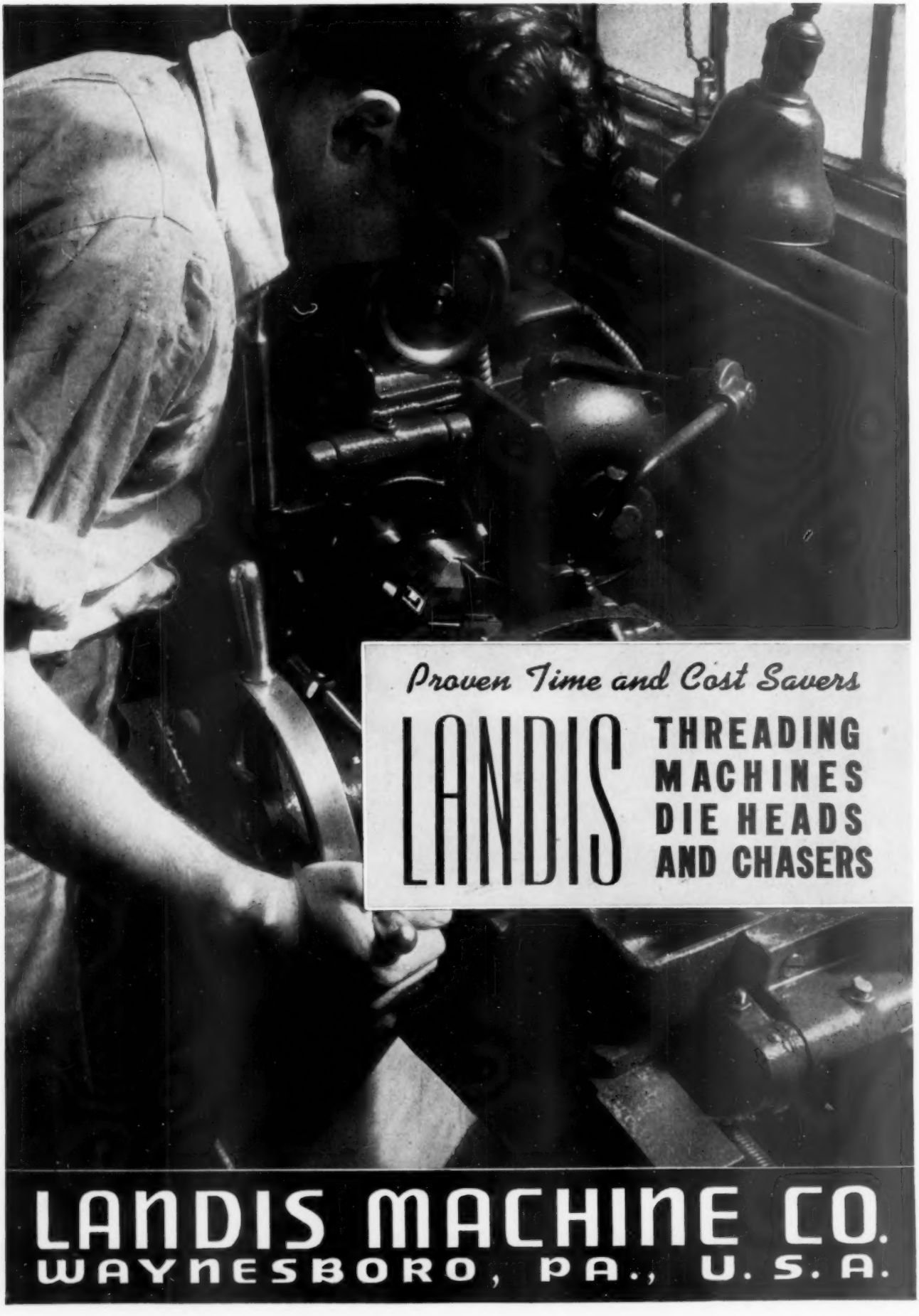
ANNEAL
STRESS RELIEVE
PREHEAT
NORMALIZE

. . . ferrous and non-ferrous metals with the *SAME* Lepel unit

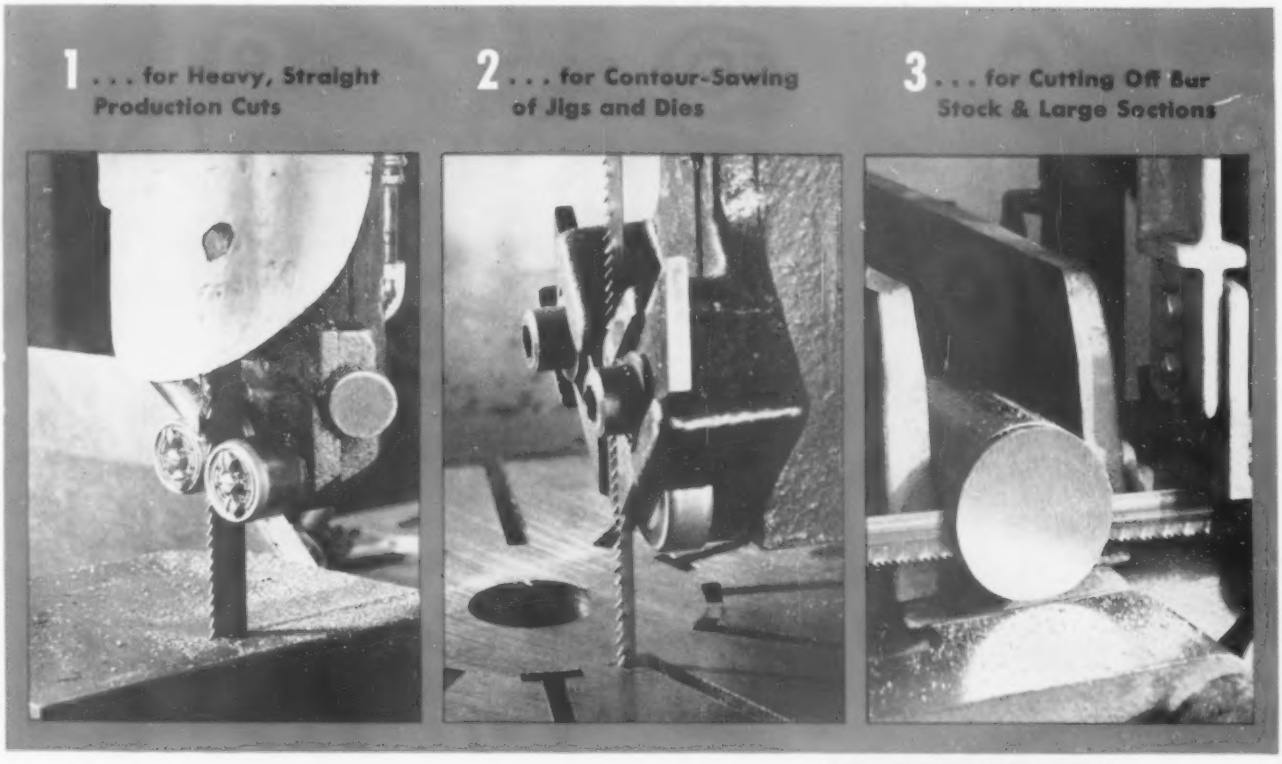
IF YOU HAVE A PROBLEM in joining, heat treating or melting of ferrous or non-ferrous metals, chances are that a Lepel High-Frequency Induction Heating Unit can help you to do a better, faster, more economical job. Lepel metallurgists and field engineers will be glad to make a thorough study of your specific problem, and help you put the right, compact, movable Lepel unit on the job. Call, or write, Lepel High Frequency Laboratories, Inc., 39 West 60th Street, New York 23, N. Y.

NOTE: Send for our 32-page catalog which gives a complete story on what high-frequency heating can do for you.

PIONEERS IN INDUCTION HEATING


Proven Time and Cost Savers
LANDIS
THREADING
MACHINES
DIE HEADS
AND CHASERS
LANDIS MACHINE CO.
WAYNESBORO, PA., U. S. A.

How
Small Shops and Big Plants
SAVE MACHINE-HOURS AND SPUR PRODUCTION
BY USING
SIMONDS METAL-CUTTING BAND SAWS



Set free your millers, shapers, lathes, broaches and drill presses *for their own work.* Use metal-band-sawing machines — and Simonds Hard Edge Bandsaws — for the types of work shown above, and many other jobs.

Simonds Hard-Edge Metal-Cutting Bandsaws are made of special electric steel poured to Simonds' own specifications to stand the shocks and strains of this work *longer than any alloy steel.* Then, too, the rounded gullets and special tooth-set makes for smoother cutting and longer blade life on any of the jobs shown above — or any others. Ask your ISD for Simonds Hard-Edge Metal-Cutting Bandsaws . . . also for Spring-Temper and Skip-Tooth Bandsaws, if your needs warrant. Or call the nearest Simonds office listed at the right.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry

SIMONDS STEEL MILLS — LOCKPORT, N. Y. — *Special Electric Furnace Steels*

SIMONDS ABRASIVE CO. — PHILADELPHIA, PA. — *Grinding Wheels and Grains*

SIMONDS CANADA SAW CO. LTD. — MONTREAL, TORONTO, VANCOUVER, SAINT JOHN, N.B. — *Simonds Products for Canada*

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S.W. First Avenue, Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Wash. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

3 announcements in 1

The New TRB-S56 SHELDON precision lathe

New . . . **an 11" lathe with "Zero Precision" Tapered Roller Spindle Bearings.**

New . . . **a moderate priced lathe with precision unsurpassed in any price class.**

New . . . **the well-known "S56" now combining 11¼" swing, 1" collet capacity and zero precision tapered roller bearings.**

SPECIFICATIONS

Headstock Bearings—Tapered Roller Bearings Zero Precision
Collet Capacity—1 inch (round)
Hole Through Spindle—1⅛ inch
Swing—11¼ inches
Bed Length—56 inches
Distance Between Centers—35 inches
Spindle Drive—Double V-belt
Spindle Speeds—8 speeds
Full Quick Change Gears—48 right and left changes; 2 to 224 threads per inch

Full Double Walled Apron—Worm driven longitudinal and cross feeds.

Dovetail Taper Gibs—Compound Rest and Cross Slide have screw adjusted tapered gibs to take up wear.

Underneath Motor Drive—4-Speed, V-Belt fully enclosed in bench pedestal.

Steel Bench—Heavy Top, Braced Welded steel construction, 5 drawers.

Write for the TRB-S56 circular.

SHELDON MACHINE CO., Inc.

4229 N. KNOX AVE. **CHICAGO 41, U.S.A.**

Improved

"MAXI"

Surface Treated Taps

You can again get "MAXI" surface treatment on "Greenfield" Taps at no extra cost.

"MAXI" was a pre-war champion when it came to tap performance. Today's "MAXI" is *better than ever.* Intensive research in "Greenfield's" metallurgical laboratory during the war has produced better formulas for surface treatment.

WHAT IS "MAXI" FINISH?

It is a heat treatment applied to High Speed Steel tools which imparts a surface hardness greater than that of an untreated tool. This surface is applied by a chemical bath. It does not affect the basic character of the metal nor the size of the tap.

COSTS NO MORE!

You can get a "MAXI" surface treatment on any "Greenfield" HIGH SPEED tool, regular or special, in any size at no additional cost. Simply add the word "MAXI" when ordering.

GREENFIELD

GREENFIELD TAP and DIE CORPORATION

GREENFIELD • MASSACHUSETTS

TungTip

TOOLS

(ON THE TIP OF THE TONGUE)

PIONEER

IN THE ART OF MILLING
WITH CARBIDES

PROMPT DELIVERIES • WRITE FOR CIRCULAR

TUNGTIP TOOLS DIV.
LOWELL & GRAYSON MFG. CO.

P. O. BOX 88 MONROVIA, CALIF.
P. O. BOX 1116 DETROIT 31, MICH.

Improvements In Latest Models

"ROCKWELL" HARDNESS TESTER
Made Only by Wilson

There are 9 improvements in the new "ROCKWELL" Hardness Tester offered today. Many or all of these improvements are lacking in models not made recently.

ACCO

WILSON MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.
373 CONCORD AVE., NEW YORK 54, N. Y.

2, 3 & 4 SPINDLE

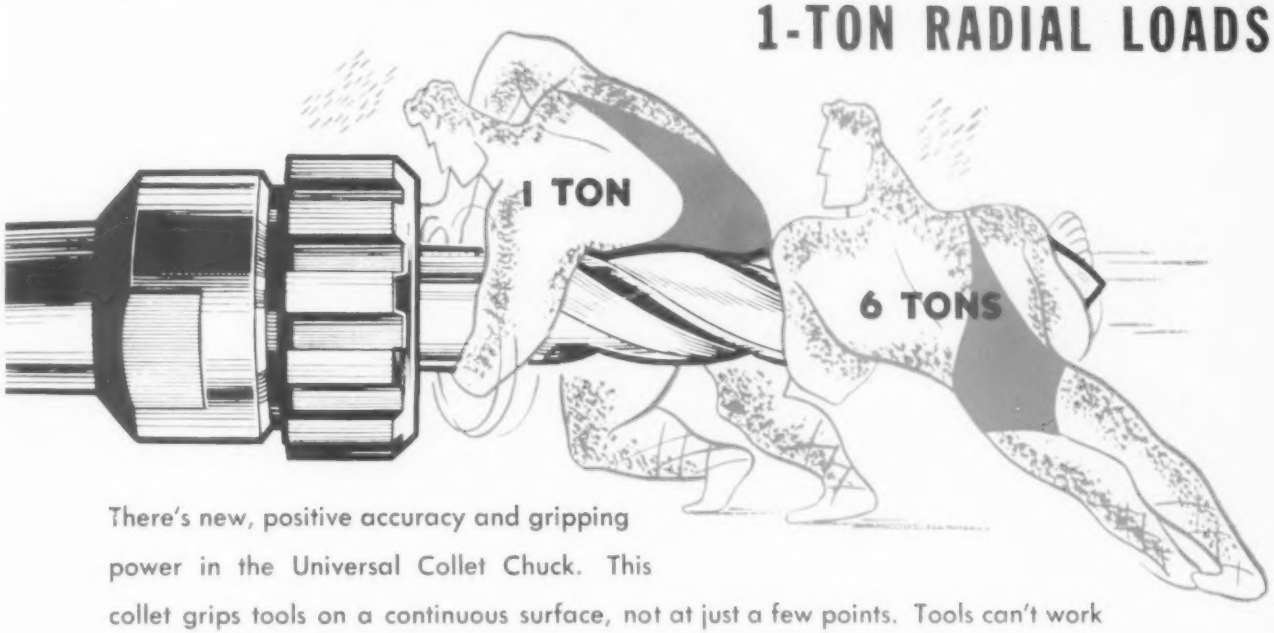
Popular standard adjustables for holes equally spaced on varying circles. Three-spindle heads available for holes equally spaced in a straight line. Recommendations for standard or special drillheads made promptly and without obligation.

FULL BALL BEARING
Adjustable Drillheads

THRIFTMASTER

DETROIT REPRESENTATIVE: E. E. PARISH, 3340 PENKELL AVENUE
THRIFTMASTER PRODUCTS DIVISION *THOMSON INDUSTRIES, INC.*
29-05 Review Avenue, Long Island City 1, New York

UNIVERSAL COLLET CHUCKS FIRMLY HOLD DRILLS, TAPS, AND REAMERS UNDER 6-TON THRUST LOADS AND 1-TON RADIAL LOADS



There's new, positive accuracy and gripping power in the Universal Collet Chuck. This collet grips tools on a continuous surface, not at just a few points. Tools can't work free under heavy feeds, high speeds, or extreme vibration—not even under thrust load pressures of 6 tons or radial load pressures of 1 ton. These modern chucks grip tool flutes, permitting stubbing. Yet, despite this intense gripping power, the Universal Collet is tightened so easily that locking effort is reduced 50%. For faster, more accurate drilling, reaming, and tapping operations in your plant, standardize with Universal Collet Chucks. Write for complete particulars.

PARKER PM MAJESTIC

Precision Economy Dependability

THE 3 ESSENTIALS IN GRINDING MACHINES

NO. 2 SURFACE GRINDER

With the return from the problems of the war years, and the era of "Buy what you could get and no matter what the cost," to Post War Production, the 3 essentials will be the watchword of prospective buyers of machinery.

The new PARKER-MAJESTIC No. 2 Surface Grinder embodies all the features gained in our forty years of experience, including a positive cross feed saddle locking device and vernier cross feed adjustment in tenths, making it without doubt the outstanding value on the market today. Furnished with either the well-known PARKER single speed motorized spindle, shown in insert, or multiple speed unit giving several speeds, ranging from 2000 to 6000 RPM.

Send for detailed circulars giving further particulars and specifications of these machines.

MODEL "B" EXTERNAL GRINDER

A companion in value is the new PARKER-MAJESTIC Model "B" External Grinder. Streamlined to present day styling, and with many new features added, makes this machine a leader in its field.

Designing has been so simplified that a novice can become very efficient in its operation in a short time.

"TWO MACHINES IN ONE"

With the quick change-over of spindle brackets shown at right, the new Model "B" can be converted to an Internal Grinder, giving double duty at less cost.

MAJESTIC TOOL & MANUFACTURING COMPANY
147 JOS. CAMPAU DETROIT 7, MICHIGAN
Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, Ontario
THE JOHN E. LIVINGSTONE MACHINERY CO., Limited, Windsor, Ontario

THE TOUGHER THE COMPETITION THE BETTER YOU'LL LIKE

MO-MAX
HIGH SPEED STEELS

When you specify MO-MAX High Speed Steel for your cutting tools, you reduce your machining costs in two ways.

First, MO-MAX cutting tools deliver up to 20% **more performance.** Second, the weight per cubic inch of MO-MAX is 8% less than that of 18% tungsten steel. This means that more tools can be made from MO-MAX than from an equivalent weight of high tungsten steel.

You can cut your costs . . . strengthen your competitive position . . . by taking advantage of this **double economy.** Start using MO-MAX today! Phone or write one of these mills listed below.

ONLY MO-MAX GIVES YOU *all* THESE ADVANTAGES

1 MO-MAX has superior cutting qualities. It is a happy combination of great toughness with high hardness.

2 The machinability of MO-MAX is unexcelled, particularly in grinding.

3 MO-MAX is economical. Its specific gravity is about 8% less than that of 18% tungsten steel. Thus for the same weight of high speed steel, 13 bars of MO-MAX are obtained as compared with 12 similar bars of an 18% tungsten steel.

4 In addition to the standard general-purpose composition of MO-MAX high speed steel, several special types have been developed for particular purposes. There are four with a high cobalt content, one high in vanadium and two that are especially suitable for hot die work.

5 MO-MAX was the first of the modern molybdenum high speed steels. For 13 years MO-MAX has demonstrated its superiority in cutting tools.

★ ★ ★

Send for your copy of the MO-MAX Handbook, sixth edition. Get the full story about this remarkable steel, including easy-to-follow instructions on heat treating.

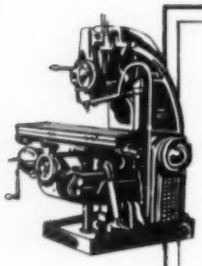
Buyer's Guide to Brands of MO-MAX

"LMW"	Allegheny Ludlum Steel Corp.
"MOHICAN"	Atlas Steels Limited
"BETHLEHEM HM"	Bethlehem Steel Co.
"MO-CUT"	Braeburn Alloy Steel Corp.
"STAR MAX"	Carpenter Steel Co.
"MOLITE M-I"	Columbia Tool Steel Co.
"REX T-MO",	Crucible Steel Co. of America
"DI-MOL"	Henry Disston & Sons, Inc.
"HI-MO"	Firth-Sterling Steel Co.
"REX T-MO"	Halcomb Steel Co.
"MOGUL"	Jessop Steel Company
"TATMO"	Latrobe Electric Steel Co.
"MIDMAX"	The Midvale Co.
	St. Lawrence Alloys, Inc.
"S. T. M."	Simonds Saw & Steel Co.
"MO-TUNG",	Universal-Cyclops Steel Corp.
"B-N-2"	Vanadium-Alloys Steel Co.
"VUL-MO"	Vulcan Crucible Steel Co.

THE CLEVELAND TWIST DRILL COMPANY • 1242 East 49th Street • Cleveland 14, Ohio

W A A 'S NEW

. . NOW 25% *average*



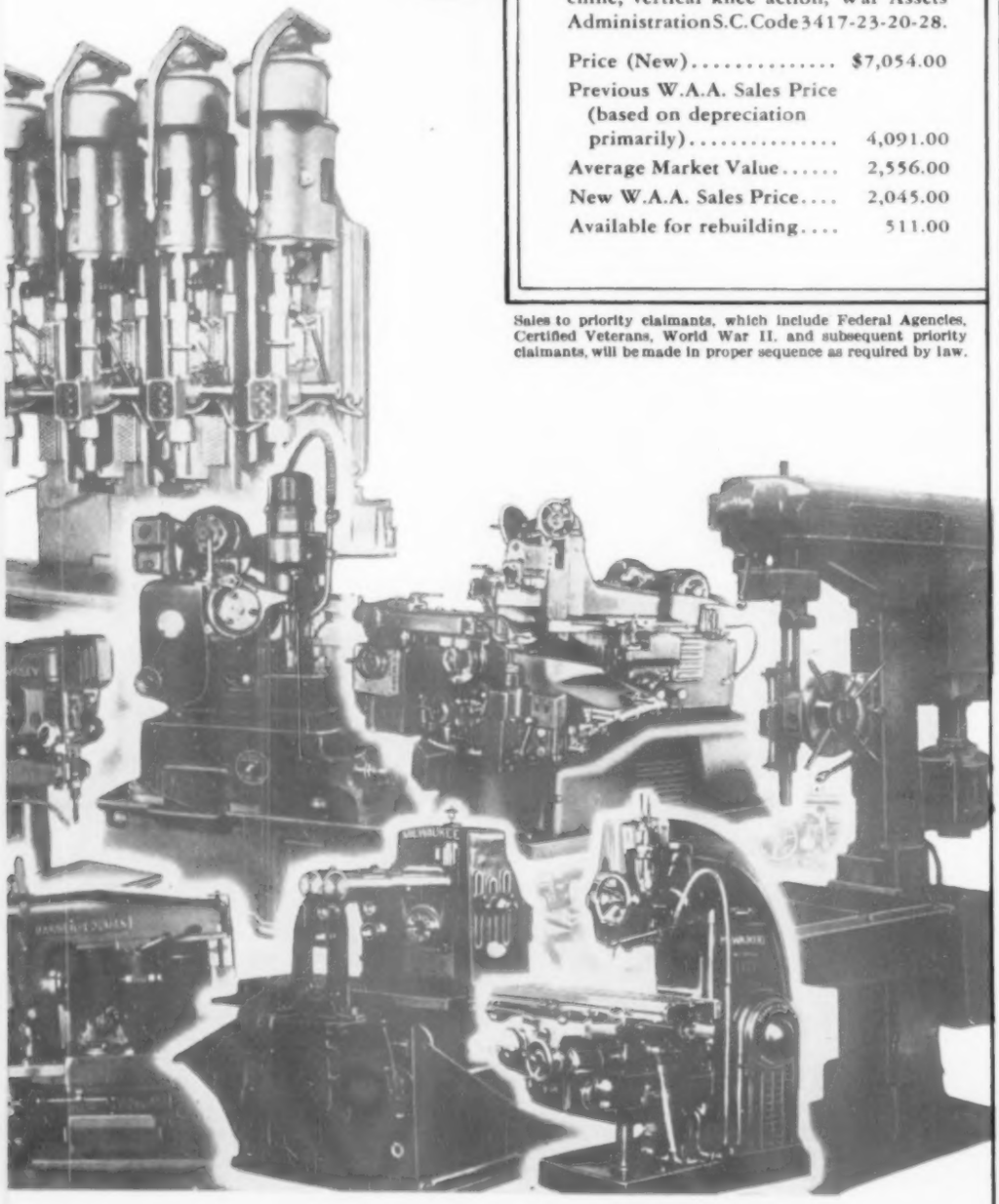
TYPICAL CASE—

MILLING MACHINE

Here is how War Assets Administration's new price has been set for a typical machine; Model 2K Kearney and Trecker Milling Machine, vertical knee action; War Assets Administration S.C. Code 3417-23-20-28.

Price (New)	$7,054.00
Previous W.A.A. Sales Price (based on depreciation primarily)	4,091.00
Average Market Value	2,556.00
New W.A.A. Sales Price	2,045.00
Available for rebuilding	511.00

Sales to priority claimants, which include Federal Agencies, Certified Veterans, World War II, and subsequent priority claimants, will be made in proper sequence as required by law.



31 TYPES OF GENERAL PRODUCTION TOOLS REPRICED

- Boring Machine—Horizontal, Precision, Bridge Type, Single and Double End
- Chucking Machine—Automatic, Vertical, Multiple Spindle Type
- Chucking Machine—Single Spindle Automatic, Horizontal Turret Type Machine
- Chucking Machine—Six Spindle Automatic, Horizontal
- Drilling Machine or Drill Press—Bench or Floor, Single or Multiple Spindle
- Gear Cutting Machine for Straight Bevel Gears, (Not Planer Type)
- Gear Hobber—Horizontal
- Gear Hobber—Vertical, Universal
- Gear Shaper—For External Spur Gears Only
- Gear Shaper—For Spur Gears, External or Internal
- Gear Shaper—For Spur and Helical Gears, External and Internal
- Gear Tooth Shaver—For External and Internal Gears (Rotary Type Machine)
- Gear Tooth Grinder—Generating Type, for Spur and Helical Gears
- Gear Tooth Grinder—For Spur Gears, External and Internal (Formed Wheel Type Machine)
- Grinders—Centerless
- Grinder—Crank Pin Grinders
- Grinders—Plain External Cylindrical Grinder
- Grinder—Internal, Cylindrical, Automatic Sizing
- Grinder—Internal Cylindrical (Hydraulic Feed Machine)
- Grinder—Internal Cylindrical, Hydraulic Feed, for Hole and Face Grinding
- Grinder—Surface, Rotary Table Type
- Lathe—Multiple Tool, Not Automatic, Manufacturing Type Production Lathe
- Milling Machine—Automatic and Manufacturing Knee Type
- Milling Machine—Plain Bed Type, Horizontal Spindle Machines
- Milling Machine—Vertical, Knee Type (Not Including Bench Type)
- Polishing and Buffing Machine—Bench and Floor
- Profiling Machine—Vertical, Fixed Bed Type, Single and Multiple Spindle
- Tapping Machine—Vertical, Single or Multiple Spindle
- Thread Grinding Machines
- Thread Milling Machine
- Turret Lathe—Ram Type, Plain and Universal

MACHINE TOOL
SALES DIVISION

BELOW MARKET

NEW "FIXED PRICE" POLICY ESTABLISHED ON 31 TYPES OF SURPLUS MACHINE TOOLS

Here is good news indeed for the man who is trying to purchase general purpose production tools for replacement, reconversion or new enterprises. Now you can go into any of War Assets 33 Regional Offices, any machine tool site sale in the United States, or any approved War Assets Administration dealer and buy at the same fixed price, everywhere, the tools in these 31 groups listed at the left. No waiting for complicated figuring of prices, checks against priorities or other delaying factors. The tools are available in such quantity that your purchase can be cleared on the spot, and immediate delivery arranged.

But even more important is the principle under which the new low prices have been set. As the scale at the right indicates each price takes into consideration your costs of rebuilding the tool to new condition, engineering, service, etc. It is set well below the current market price for similar equipment sold on a full service basis. The differential is approximately 25% below market—enough for men with tooling "know-how" to realize a neat "extra" profit and at the same time acquire modern machine tools.

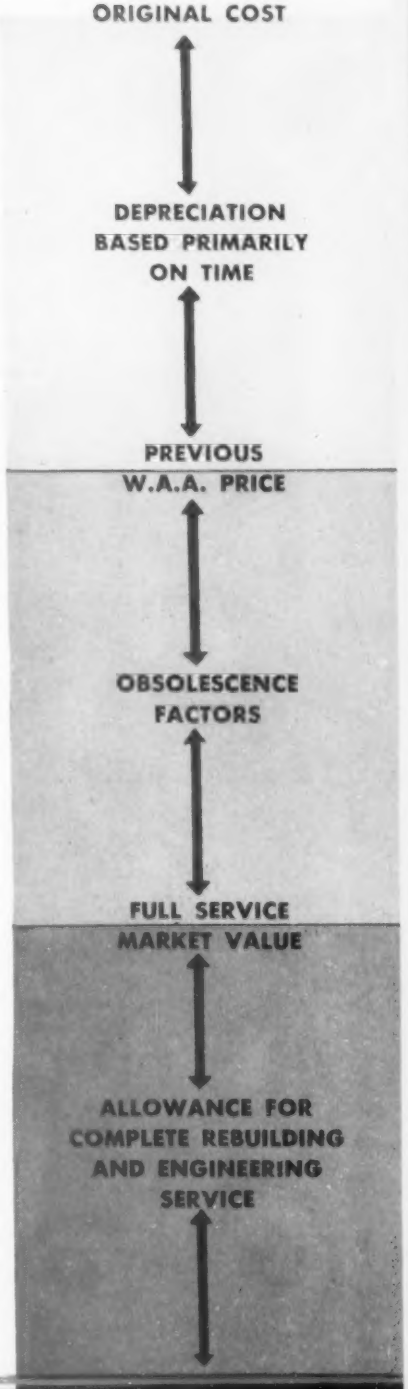
Plan now to check at once the detailed price and specifications list—now available in every War Assets Administration office (machine tool sales division) and the offices of your approved W.A.A. machine tool dealers.

FOR DETAILED PRICE CATALOG —*WRITE, WIRE OR PHONE:*

1. *Your Regular Machine Tool Dealer*
   War Assets Administration has appointed more than 3,000 "approved" dealers throughout the U. S.
2. *W.A.A. Machine Tool Sales Division*
   In any of the 33 War Assets Administration Regional Offices listed below.

686-1

W.A.A.'S NEW PRICING PRINCIPLE



EXTRA PROFIT AREA

For Alert Buyers With Tooling "Know-How." You can completely rebuild the tool, meet engineering and haulage costs and still save money.

WAR ASSETS ADMINISTRATION

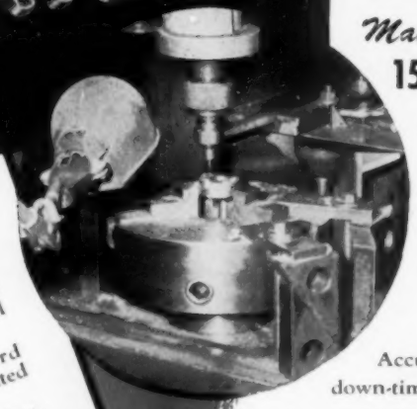
GOVERNMENT OWNED SURPLUS

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Fort Worth • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane • Tulsa

Injection Molds Completed

5 TIMES FASTER ON A GORTON

3-DIMENSIONAL PANTOGRAPH



JOB FACTS

NAME OF PART—Injection Mold.

MATERIAL—Tool Steel (oil hardening).

MACHINE—Gorton 3-Dimensional Engraver Model 3-L.

ATTACHMENTS—Standard three jaw chuck mounted on table.

TOOLS USED—Special Cutters ranging from .035" dia. to .340" dia.

TEMPLATE USED—2 to 1 frill shape master.

FORMER TIME—15 hours per mold.

PRESENT TIME—3 hours per mold.

ACCURACIES—All dimensions held to .0005".

Machining Time Reduced from 15 Hours to 3 Hours per Mold

ACCURACIES HELD TO .0005"

Here's an example of the type of performance you'll get on a Gorton 3-Dimensional Pantograph Engraving Machine. This large manufacturer experienced difficulty in the production of these injection molds. Time required was 15 hours per mold. Accuracies were hard to maintain. Machine down-time was excessive. Man hours were wasted.

In an effort to remedy these, the job was tooled-up on a Gorton 3-Dimensional Engraving Machine. First an enlarged master template was cut. Then, using this as a pattern, the desired molds were turned out at the correct size at the rate of one every 3 hours. The other disturbing factors were also remedied. Dimensions were held to .0005" due to Gorton pantographic reduction method. Down-time was drastically reduced. Man hours were conserved.

QUALITY WORK ON A PRODUCTION BASIS

Gorton Pantograph Machines are noted for the consistency with which they turn out quality work on a production basis. They are available in both 2 and 3-dimensional models to handle many types of reproduction assignments. They can be used with high efficiency on any machinable material and their operation is extremely simple.

HOW TO PREDETERMINE THE RESULTS OF TOOLING YOUR JOB ON A GORTON PANTOGRAPH

Send detail prints or a work sample to Gorton Engineering Service at the address below. Tooling information and production estimates will be furnished promptly—no charge or obligation. You can then predetermine the possible improvement over your present methods.

GEORGE GORTON MACHINE CO.

2612 RACINE STREET, RACINE, WISCONSIN, U.S.A.

FREE ADDITIONAL INFORMATION

Get the details on Gorton Pantographs and other Gorton machines by sending today for your copy of Bulletin No. 1655

TO SERVE BETTER

Years of hard work, thinking and production are the base upon which now stands our new home. We move into the future combining the strength of 2 former plants into a single plant that will help serve your precision machinery and production problems *BETTER*. Inside this building every man is proud of his part in this achievement—a tool of opportunity that will carry their hopes even further—to serve you *BETTER*.

OLOFSSON
TOOL AND DIE COMPANY
LANSING 2, MICHIGAN

CHICAGO ENGINEERING OFFICE — BUILDERS BLDG., 228 NORTH LA SALLE ST., CHICAGO, ILL.

With Two DI-ACRO BENDERS

A difficult production problem of forming two bends in a long length of tubing was solved by "teaming up" two DI-ACRO Benders as illustrated. This dual-forming arrangement saved installation of special machinery. Two accurately formed bends are obtained in one operation—without distortion of the tube and at a cost competitive to power operated equipment. More than 300 pieces are completed per hour—600 individual bends.

"DIE-LESS DUPLICATING" Often Does it Quicker WITHOUT DIES

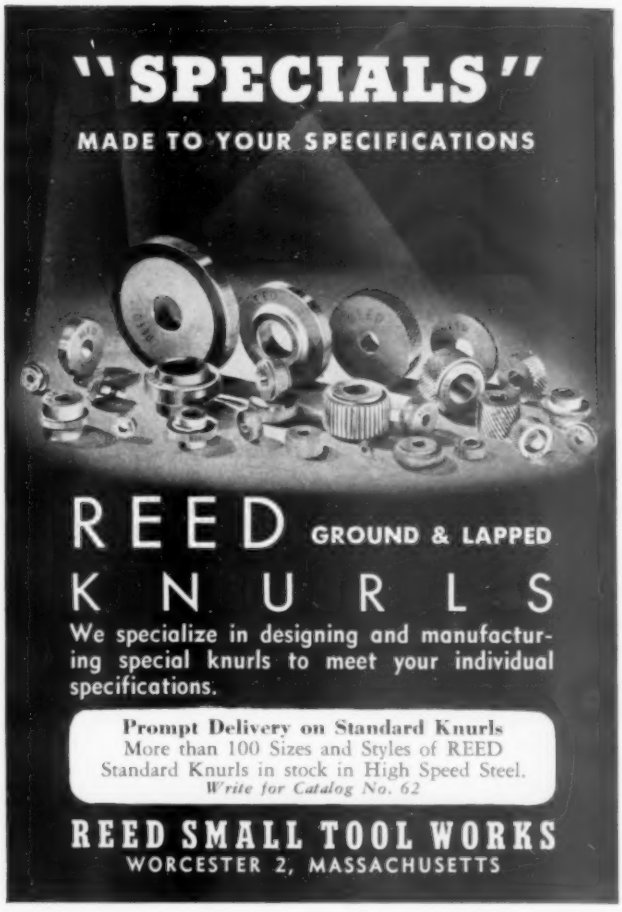
This is but one example of how DI-ACRO precision machines—Benders, Brakes and Shears—can accurately and economically duplicate a great variety of parts, pieces and shapes, without die expense. Write for catalog—"DIE-LESS DUPLICATING".

← DI-ACRO is pronounced "DIE-ACK-RO"

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

375 EIGHTH AVENUE, LAKE CITY, MINNESOTA



REED GROUND & LAPPED KNURLS

We specialize in designing and manufacturing special knurls to meet your individual specifications.

Prompt Delivery on Standard Knurls
More than 100 Sizes and Styles of REED Standard Knurls in stock in High Speed Steel.
Write for Catalog No. 62

REED SMALL TOOL WORKS
WORCESTER 2, MASSACHUSETTS

TOOL ENGINEERS
GET THIS CATALOG!

"Standard" Steel Die Sets are stocked in a wide range of sizes; Back pin style available for immediate delivery. Prices and delivery on special die sets quoted promptly.

Ask for catalog.

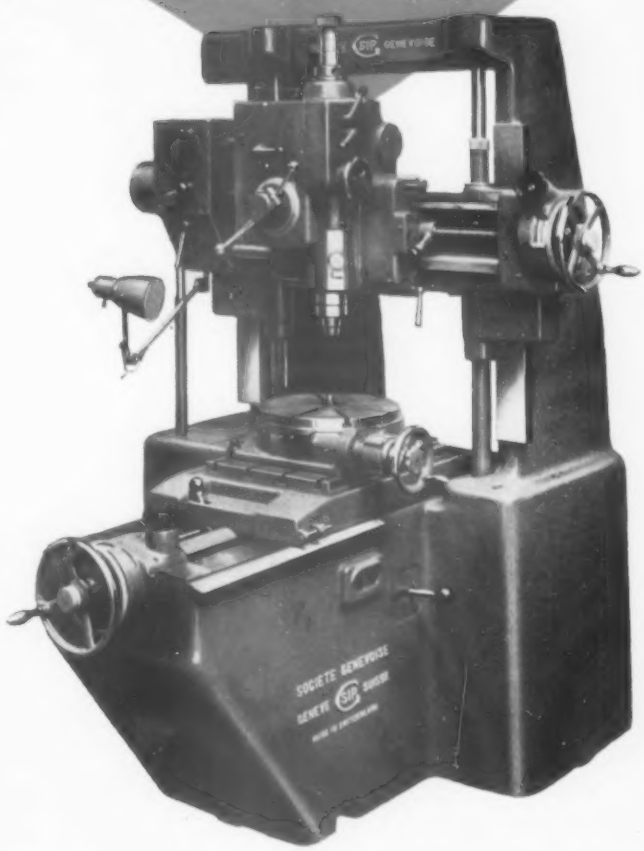
STANDARD MACHINERY COMPANY
1585 Elmwood Ave.
Providence 7, R. I.

Manufacturers of Power Presses to 500 Tons • Rolling Mills • Swagers • Turks Heads

Newest

CONTRIBUTION TO HIGH PRECISION IN METAL WORKING!

No. 3K SIP JIG BORER



On the new SIP No. 3K Jig Borer, direct readings can be made to 0.00005 inches —without using separate instruments! All settings are made with built-in measuring devices. Table, spindle saddle and cross-rail are rigidly mounted to preserve perpendicularity, so that accuracy to 0.0002 inches can be maintained over the complete range of operations. New large table working surface 20½ x 15 inches . . . powerful spindle speeds from 75 to 2000 R.P.M. . . . six automatic spindle feeds in either direction . . . make the 3K Jig Borer capable of rapid machining over a wide range. For machining very small holes, it can be equipped with a guiding arm holding interchangeable bushes and carried on a scraped prismatic surface on the lower part of the SIP tilting rotary table, any combination of rectangular and polar coordinates can be laid out rapidly and accurately.

SIP JIG BORERS - RANGE OF TABLE SIZES

Write for full details of the new 3K and other SIP Jig Borers in the following range of table sizes.

No. 2C	18" x 10⅜"
No. MP-2H	27½" x 12½"
No. MP-3K	20½" x 15"
No. 4G	27½" x 23⅝"
Hydroptic B	39½" x 32"

HIGH PRECISION MACHINE TOOLS AND MEASURING INSTRUMENTS

COSA CORPORATION

COSA

CHRYSLER BUILDING
New York 17, New York

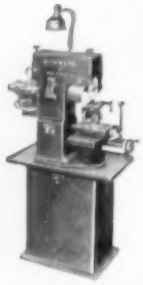
Hammond OF KALAMAZOO

ABRASIVE BELT GRINDERS

Model VH-6WP Wet-n-Dri 6" belts. Used horizontally or vertically.

Model F-2 Flexible Belt, ½" to 2" belts. Especially suitable for irregular shaped parts.

CARBIDE GRINDERS



Chip Breaker and Diamond Finishing Grinder.

10" Wet Carbide Tool Grinder.

Hammond Machinery Builders INC.

1661 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN

WRITE FOR OUR NEW CATALOG 46

DON'T SCRAP
WORN AND BROKEN CUTTERS

FOR 34 YEARS WE HAVE SPECIALIZED IN RESTORING DRILLS, REAMERS, COUNTERBORES, MILLING CUTTERS, ETC., TO NEW USEFULNESS

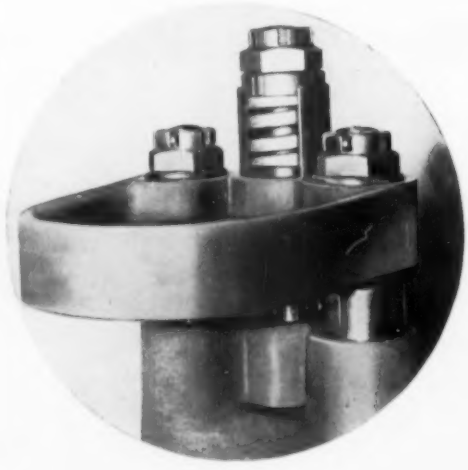
Let us help you reduce your cutting tool costs just as we have for hundreds of others

H. S. S. & TUNGSTEN CARBIDE

REPRESENTATIVES IN ALL INDUSTRIAL CENTERS

NATIONAL TOOL SALVAGE CO.

6511 EPWORTH BLVD. DETROIT 10, MICHIGAN



SWARTZ LS TYPE FIXTURE

A spring jig with solid clamping, as built only by Swartz. A heavy die spring prevents parts loosening if heavy drill pressures force the work lower into the adapters.

ASK FOR CATALOG NO. 941

SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley Avenue — Detroit 27, Michigan

Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Houston—Engineering Sales Co.
Chicago—Ernie Johnson

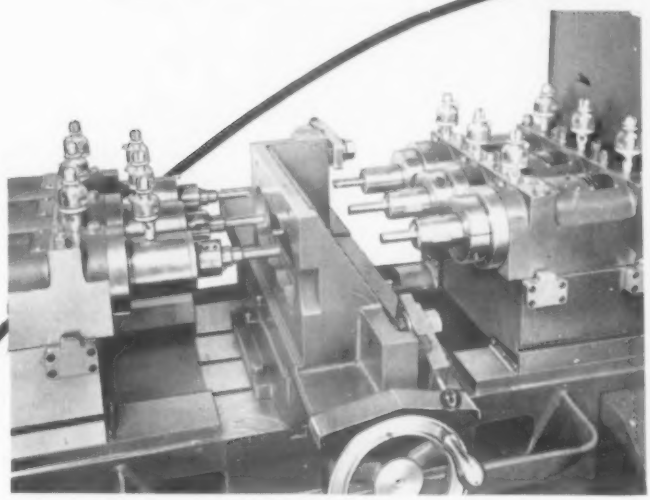
Represented by

Canada—Hi-Speed Tools, Ltd., Galt, Ont.
Boston—A. R. Shevlin Co.
Los Angeles—Production Tool Engineering

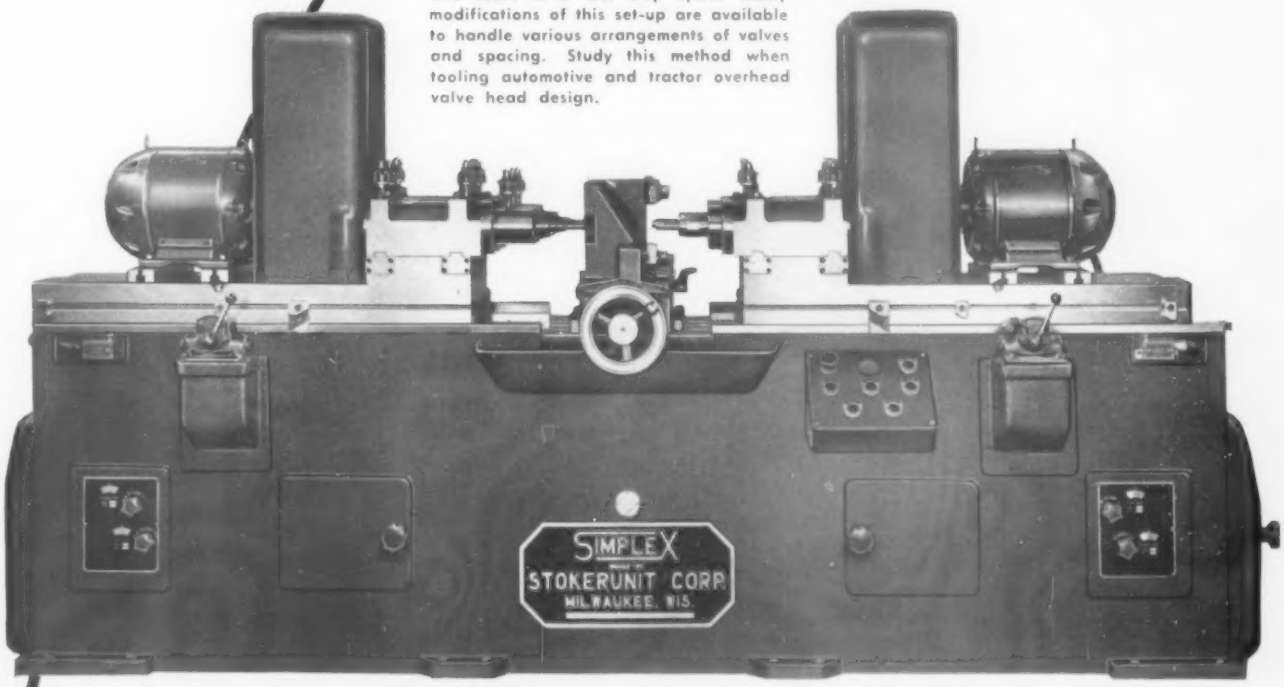
Oneida, N. Y.—W. F. Himmelsbach
Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool & Equipment Co.

SIMPLEX

The life and efficiency of a gasoline engine depends much upon the accuracy of valves and valve guides. One progressive manufacturer found that by placing the cylinder heads for an overhead valve engine in a simple cross-sliding fixture, semi-finish boring one side and precision boring the valve guides and valve seats from the other, he achieved the finest precision and engine performance.



This SIMPLEX 2U 2-way Precision Boring Machine, with three #1 spindles on each side and cross-sliding fixture, bores two intake and two exhaust valve guides and seats in a four step cycle. Many modifications of this set-up are available to handle various arrangements of valves and spacing. Study this method when tooling automotive and tractor overhead valve head design.



Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4528 West Mitchell Street, Milwaukee 14, Wisconsin

Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

That Unseen Extra Quality

MEN WHO KNOW

Specify "Republic"

Inspectors and Production men whose first consideration is value, invariably pick REPUBLIC GAGE as their source for gages.

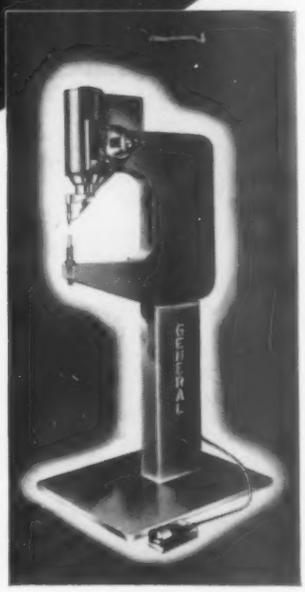
For years REPUBLIC has enjoyed top rating as manufacturers of thread gages with "THAT UNSEEN EXTRA QUALITY." May we serve you?

RELY ON REPUBLIC

REPUBLIC GAGE

DETROIT 21, MICHIGAN

RIVETERS
Built for YOUR Job
at "STOCK-LINE" prices



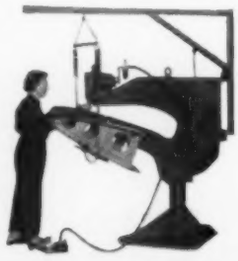
General Riveters will furnish a machine tailored to exactly fit your needs at a stock item price

THERE'S no need to pay a premium price for a special machine. If you have a riveting problem, we have the answer in a riveter especially designed for your job. Best of all, it will probably cost no more than a stock riveter.

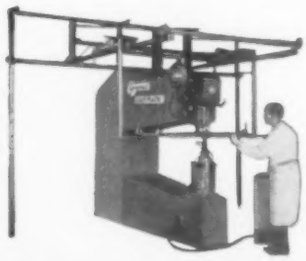
Under present conditions, many industries find it aids production, where the work permits, to use General Automatic feed riveters, equipped with indexing fixtures. They insure maximum output by setting the pace for the operators, and improve quality by reducing the human element.

Let us survey your riveting operations and recommend the best equipment for the job. There is no obligation. Simply send blue-prints or samples of parts to be riveted with a description of your present assembly procedure and production requirements. General Riveters Equipment is guaranteed, deliveries are prompt.

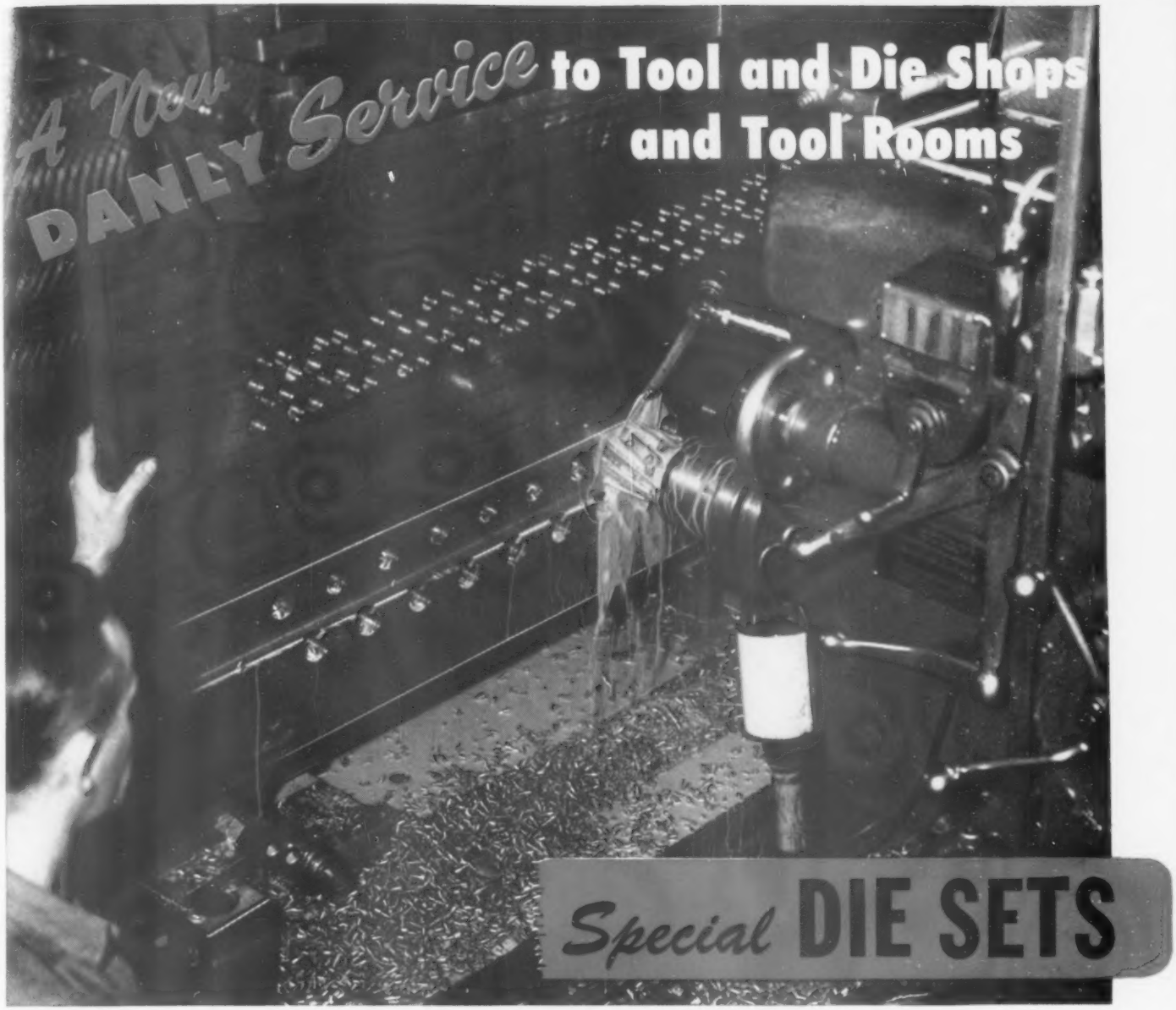
Pneumatic Squeezer for leading edges.



Combination Drill and Automatic Feed Hydraulic Squeezer.



GENERAL RIVETERS INC.
formerly GENERAL ENGINEERING CO.
781 HERTEL AVE. BUFFALO 7, N.Y.



with any special machining required

So many customers have requested additional machine work on special die sets, that such service is now made generally available.

Complete equipment is installed to do any desired machine work to the customer's specifications on any special die set made by this company including M-K & A-S sets, as listed in general catalog.

These special die sets may now be delivered completely machined ready for the mounting of the die. This service saves time, as the work on the die and the die set can proceed simultaneously.

It permits the die shop or tool room to devote their equipment and man hours to the making of dies.

This service also solves the problem of the handling of big sets, for which the die shop or tool room may not have the machining or handling equipment to perform the necessary work economically.

We would like to know what you think of this new Danly Service to the tool and die shops and tool rooms of America. On your next special die set inquiry include the additional machining work that you believe could be advantageously handled "on the outside." The cost of such machining will be shown as an individual item in the quotation.

DANLY MACHINE SPECIALTIES, INC.

2100 South 52nd Avenue • *Chicago 50, Illinois*

Milwaukee 2 . . . . 111 East Wisconsin
Detroit 16 . . . . . 1549 Temple Avenue
Cleveland 14 . . 1550 East 33rd Street
Dayton 2 . . . . . 990 East Monument
Rochester 4 . . . 16 Commercial Street
Philadelphia 44 . . 18 W. Chelten Ave.
Long Island City 1 47-28 37th Street

Ducommun Metals & Supply Company
4890 South Alameda, Los Angeles 7

DANLY *Special* DIE SETS

MACHINED TO YOUR SPECIFICATIONS

THE ONLY PUMP FOR SHALLOW SUMPS

- The Pioneer Model VBA is particularly suited to shallow sumps.
- Design of housing will allow VBA to pump sump dry.
- Seal design makes pump inches shorter —will get right down to the floor.
- Adaptable to machines where large chips or shavings are in coolant.
- Long hour heavy-duty ball bearing motors give long, continuous service.
- Standard models available in capacities of 13—148 gallons per minute.

PIONEER Pumps
SEAL TYPE, SEAL-LESS AND ROLLWAY
FOR PUMPING COOLANTS • CUTTING FLUIDS ABRASIVE LIQUIDS • LUBRICANTS • WATER

Pioneer Pump & Manufacturing Co.
19645 JOHN R ST. • DETROIT 3, MICHIGAN

New GOVRO-NELSON DRILLING UNIT

1. New, free-rolling centrifugal-weight design.
2. Centrifugal mechanism runs in bath of oil. Seals at motor and spindle retain oil—prevent entry of coolant.
3. Three-point, ball-bearing suspension, for smooth operation.
4. Built-in rate of feed control, to provide slow feed for reaming or rapid movement for other operations.
5. Dwell at end of stroke.
6. Can be operated continuously at 40 operations per minute.
7. Simplified method of reset.
8. Completely automatic with electrical controls.
9. Integral foot for accurate alignment.
10. Machined diameter at nose for special adaptations.

WRITE FOR Literature

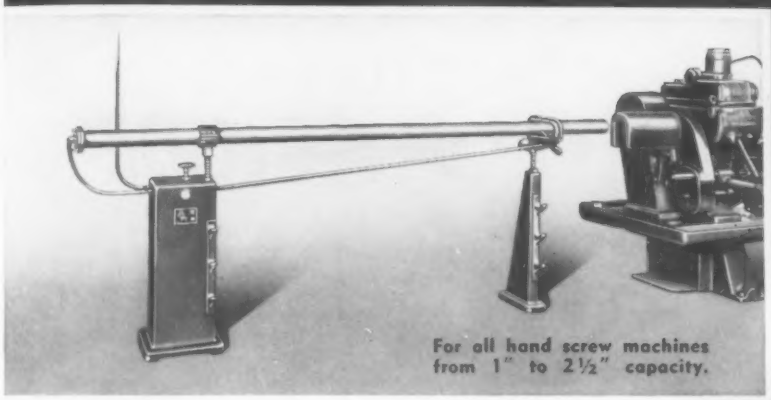
GOVRO-NELSON CO.
1933 Antoinette
DETROIT 8, MICH.

Automatic DRILLING UNIT

SAWING FILING

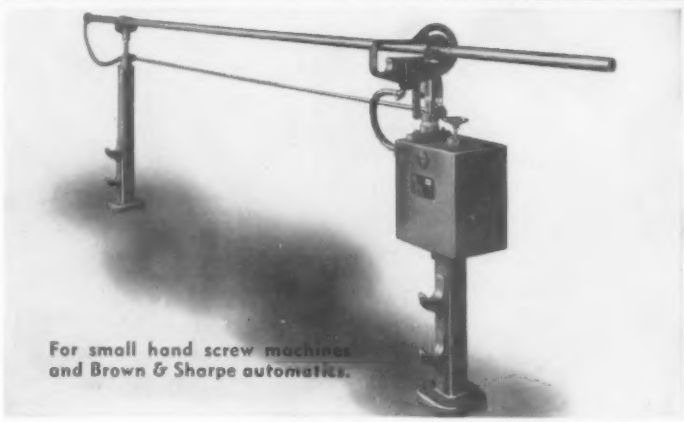
GROB BROTHERS
GRAFTON WISCONSIN

Proved in Service! LIPE BAR-FEEDS



For all hand screw machines from 1" to 2½" capacity.

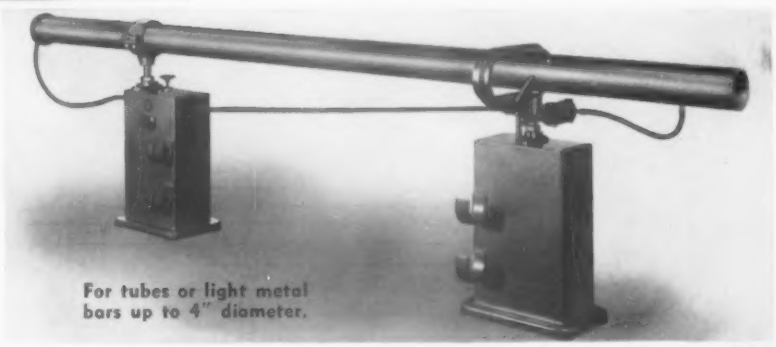
GIVE 20% GREATER SCREW MACHINE OUTPUT *in the simplest or the most complicated operations*



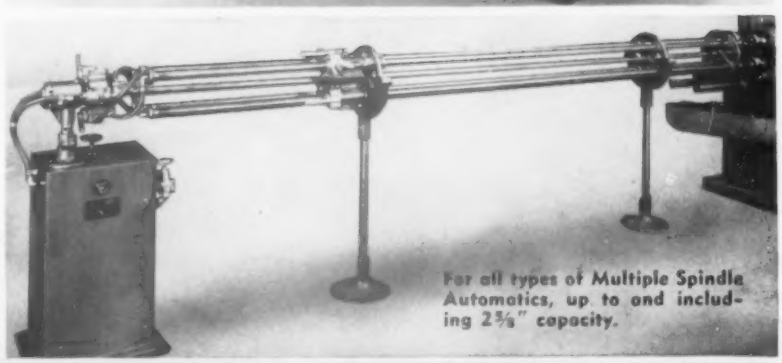
For small hand screw machines and Brown & Sharpe automatics.

DEVELOPMENT after development, built on the success of Lipe Pneumatic Bar Feeds in the hands of the most exacting production men, have provided units suitable for the smallest to the largest screw machine—hand operated or automatic. Over a wide range of screw machine or turret lathe work, all these advantages can now be made use of, in modernizing your production methods

- Saves up to 20 minutes per 12 ft. bar.
- Feeds automatically to the smallest end piece.
- Accurately feeds any required distance.
- Handles exact-size polished stock without marring or scratching.
- No noise — safe — bar completely enclosed.
- Reduces scrap loss.
- Quickly reloaded with a single motion.



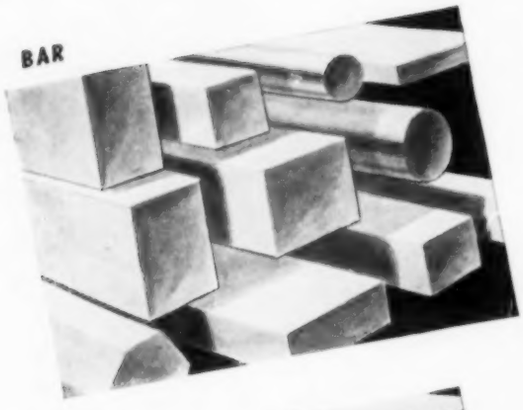
For tubes or light metal bars up to 4" diameter.



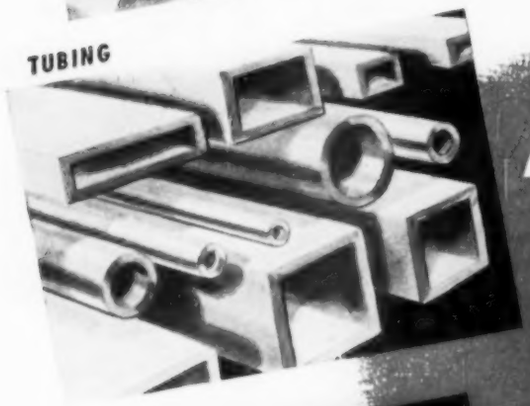
For all types of Multiple Spindle Automatics, up to and including 2⅝" capacity.

Throw away your feed fingers . . . and pushers. See how you can get rid of complications . . . and save money. Write today for complete descriptions and engineering data.

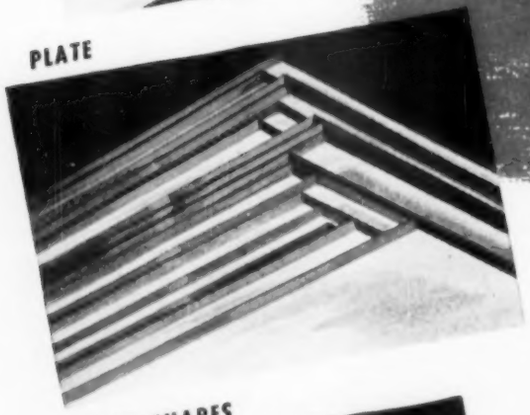
Lipe-ROLLWAY CORPORATION, Syracuse 1, N. Y., U.S.A.
Cable Address: LIPEGEAR

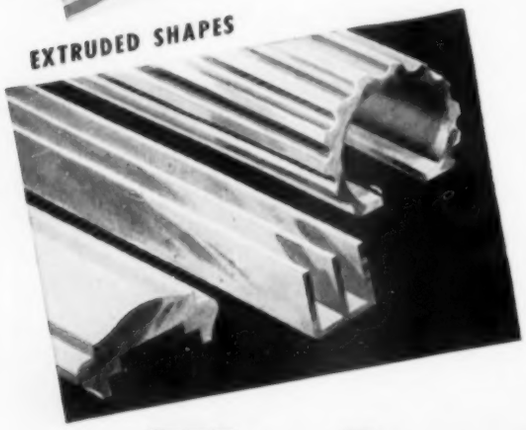


ALUMINUM MILL PRODUCTS



AVAILABLE TO FABRICATORS right now!





Consider your aluminum needs—then get in touch with your nearest War Assets Administration Regional Office to see if we can fill your requirements. Even your highly specialized requirements might be filled from WAA surplus stocks. It costs nothing to find out. Orders are filled quickly and without fuss.

All metals are sold under existing priority regulations. VETERANS OF WORLD WAR II are invited to be certified at the War Assets Administration Certifying Office serving their area, and then to purchase the materials offered herein.

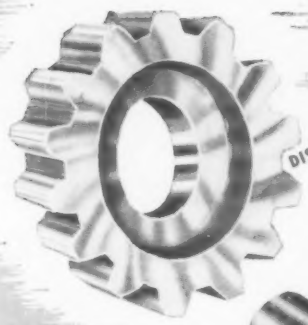
Exporters are considered as wholesalers in the purchase of surplus property. Any question on export control should be referred to Office of International Trade, Department of Commerce, Washington, D. C.

WAR ASSETS ADMINISTRATION

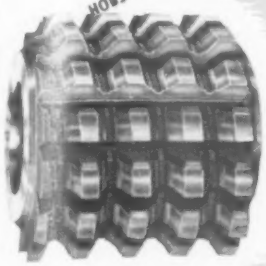
GOVERNMENT OWNED SURPLUS

Offices located at: Atlanta · Birmingham · Boston · Charlotte · Chicago · Cincinnati · Cleveland · Dallas · Denver · Detroit · Fort Worth · Helena · Houston · Jacksonville · Kansas City, Mo. · Little Rock · Los Angeles · Louisville · Minneapolis · Nashville · New Orleans · New York · Omaha · Philadelphia · Portland, Ore. · Richmond · St. Louis · Salt Lake City · San Antonio · San Francisco · Seattle · Spokane · Tulsa

157-9

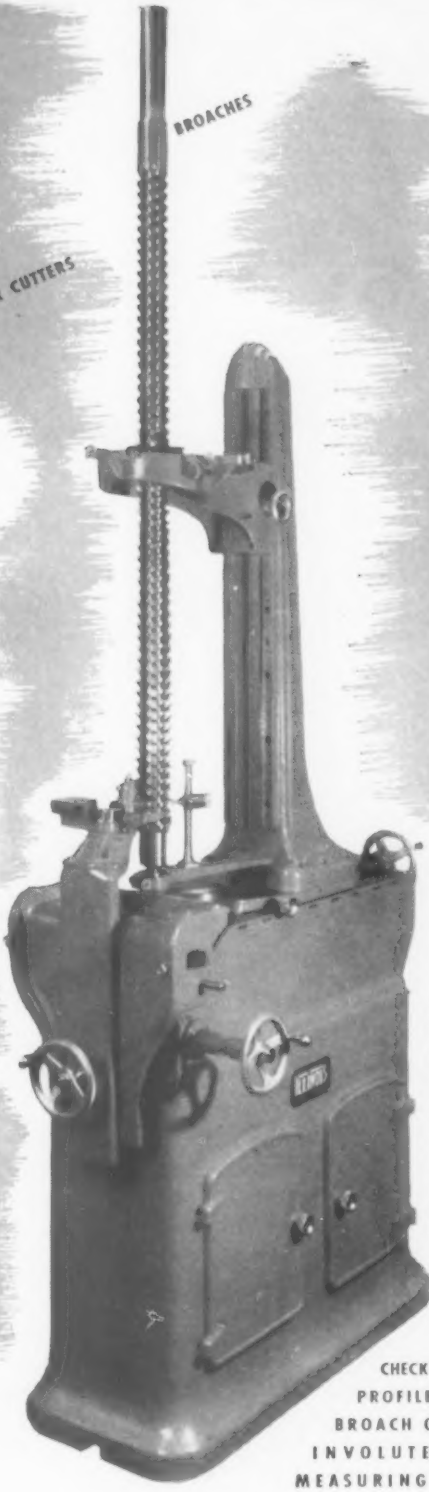


DISC TYPE SHAPER CUTTERS



HOBS (FROM STOCK)

SHANK TYPE SHAPER CUTTERS



BROACHES

Complete
INVOLUTE SPLINE TOOLING
to the
NEW AMERICAN STANDARD B 5.15-1946

Illinois Tool engineers helped formulate the basic principles of the new A.S.A. Involute Spline Standard B 5.15-1946 which was officially adopted October 14, and are, therefore, particularly well qualified to discuss its applications and production methods.

Hobs (available *now* from stock), Shaper Cutters and Broaches produced at Illinois Tool, where tolerances and fits can be correlated under the same engineering direction, offer an impartial selection of tooling best suited to your requirements.

All tools are subjected to precise inspection on Illinois Measuring Machines to insure true involute profile. Because Illinois Tool can supply the *complete* tooling—Hobs, Shaper Cutters and Broaches, it is the logical source for your involute spline cutting tools.

CHECKING INVOLUTE PROFILE OF SPLINE BROACH ON ILLINOIS INVOLUTE PROFILE MEASURING MACHINE

HEADQUARTERS FOR ENGINEERED CUTTING TOOLS

Overnight to all America from the hub of air transportation.

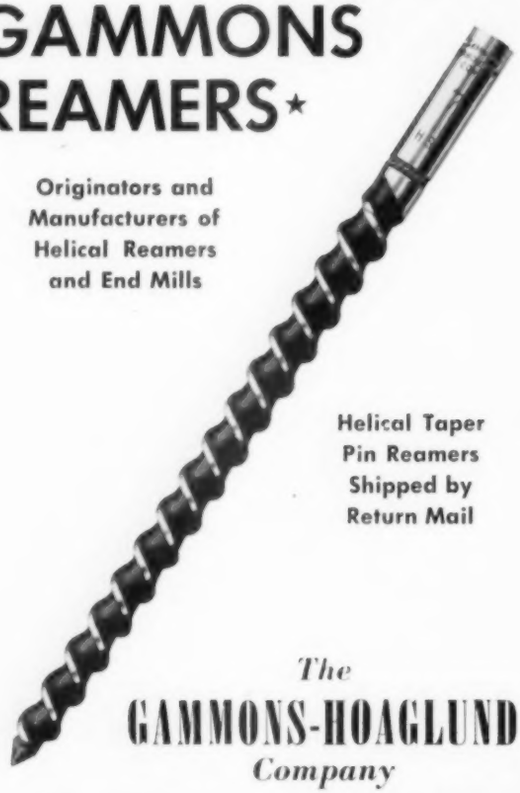
ILLINOIS
TOOL WORKS

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

2501 N. Keeler Avenue, Chicago 39, Illinois
In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

GAMMONS REAMERS★

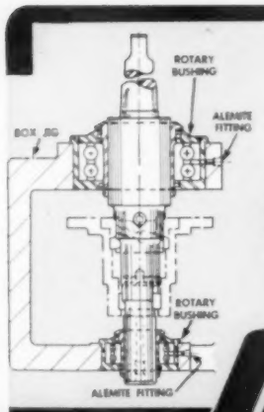
Originators and Manufacturers of Helical Reamers and End Mills



Helical Taper Pin Reamers Shipped by Return Mail

The
GAMMONS-HOAGLUND
Company

400 MAIN STREET, MANCHESTER, CONN.



SEALED
PRECISION BALL BEARING CONSTRUCTION

GATCo ROTARY BUSHINGS

FOR DRILLING, CORE DRILLING, ROUGH AND FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

Eliminates expensive tool construction—Reduces tool wear—Prevents seizure and pilot breakage—Especially adapted where precision is required.

Write for full information and prices

GIERN & ANHOLTT TOOL CO.
1302 Mt. Elliott Avenue • Detroit 7, Michigan

Made to Fit Any Machine

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

Keep YOUR TAPS AND REAMERS IN SERVICE LONGER!

WRITE FOR CATALOG

Taps and reamers that are apparently worn out can often be given a new lease of life by simply changing over from ordinary tool holders to the Ziegler Tool Holder.

This is because faulty tapping and reaming, resulting in oversize or bell-mouthed holes, may be due to inaccuracies in spindle alignment rather than to any fault in the tool itself. If so, the trouble can be corrected by using the Ziegler Floating Holder—a special type of holder that automatically compensates for spindle misalignment up to 1/32" radius or 1/16" diameter.

You will find that it is economy to buy a Ziegler Holder rather than to invest in new taps and reamers.

W. M. ZIEGLER TOOL CO.
1930 Twelfth St.
Detroit 16, Mich.

Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

There's more to grinding grades than the A, B, C's

The A, B, C's which appear as identification on a grinding wheel help simplify proper grade selection. By clearly showing relative hardness, they make your choice quicker, easier...aid in assuring the right grade for the job. That's one reason wheels by CARBORUNDUM are plainly marked. But, there's more to it than the old chestnut, "the softer the metal, the harder the wheel." It's not that easy.

You realize, for instance, that wheel speed itself affects grinding action. The same grade reacts differently at various speeds. The condition of the machine and the amount of vibration can make a difference. Desired finish...required tolerance must be considered. Coolant conditions vary. The actual type of operation—snagging, surfacing, internal grinding or whatever it is—influences practical selection.

Yes—there are many important factors to check before you can be sure of the right grade designation for the job.

That's why we suggest consulting your CARBORUNDUM salesman or our distributor's representative. These men work throughout the year on a wide variety of grinding problems. They are familiar with grinding in production... in tool rooms...wherever it is used. They have practical knowledge and experience to help you pick exactly the wheel you need for the job.

Assisting these representatives in the field are our Abrasive Engineers. Specialized experts, they are equipped to analyze uncommon problems...recommend sound solutions. And, here in our modern laboratories are scientists and technicians who are working on the application of abrasive developments to changing grinding practices.

This *three way route* to better grinding is easy to use. No obligations are incurred. Merely talk "grinding" with a CARBORUNDUM representative. He'll be glad to assist you. The Carborundum Company, Niagara Falls, N. Y.

A good rule for good grinding... **CALL IN**

CARBORUNDUM

TRADE | MARK

ABRASIVE WHEELS

Silicon Carbide
Aluminum Oxide
Diamond

COATED AND BONDED ABRASIVES

Paper and Cloth Combinations
Sheets, Rolls, Discs
Cylinder Hones
Sticks, Stones & Rubs
Specialties

ABRASIVE GRAINS AND COMPOUNDS

for:
Polishing
Lapping
Pressure Blasting
Finishing

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company

TOOLS for PRECISION PRODUCTION

Reciprocating Action (In and Out)

PORTABLE
Electric
RECIPROCATING TOOL

Motion is "in and out"—not spinning or rotary. Tool is portable—light weight—carry it anywhere—easy to handle. Self contained. Ready to plug into any 110 volt electric outlet. Use it to work on any metal, wood, plastic or other materials that may be filed, sawed or polished. Delivers 1000 strokes per minute, much faster than hand methods. Complete line of files, scrapers, hones and other accessories available.

AIR GUNS

THE ONLY AIR GUNS WITH ENCLOSED LEVER CONNECTED TO THE VALVE BY A BALL AND SOCKET JOINT

Valve completely enclosed. Eliminates Packing Glands.

Slight movement of lever gives complete discharge.

Features that make it the choice of the most modern plants—

- Leakproof
- Streamlined to Hose
- Instant, Positive Shut-off
- Simple Design
- Low Maintenance
- For Air or Water

PROMPT DELIVERY

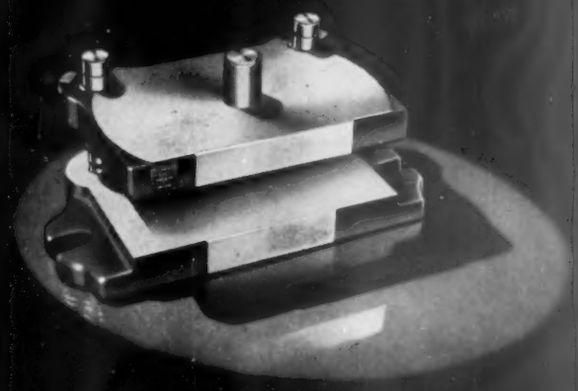
Write for Literature

PRECISION PRODUCTION TOOLS

ACME TOOL COMPANY

96 WARREN STREET • NEW YORK 7, N. Y.

Die Sets for Every Stamping Job



Our constant endeavor to deliver a better product is the basis of our ever-increasing volume of business. We invite your inquiries regarding all-steel and semi-steel, standard and special die sets; dowel pins, cap screws, die springs and other accessories.

CALL "DETROIT"

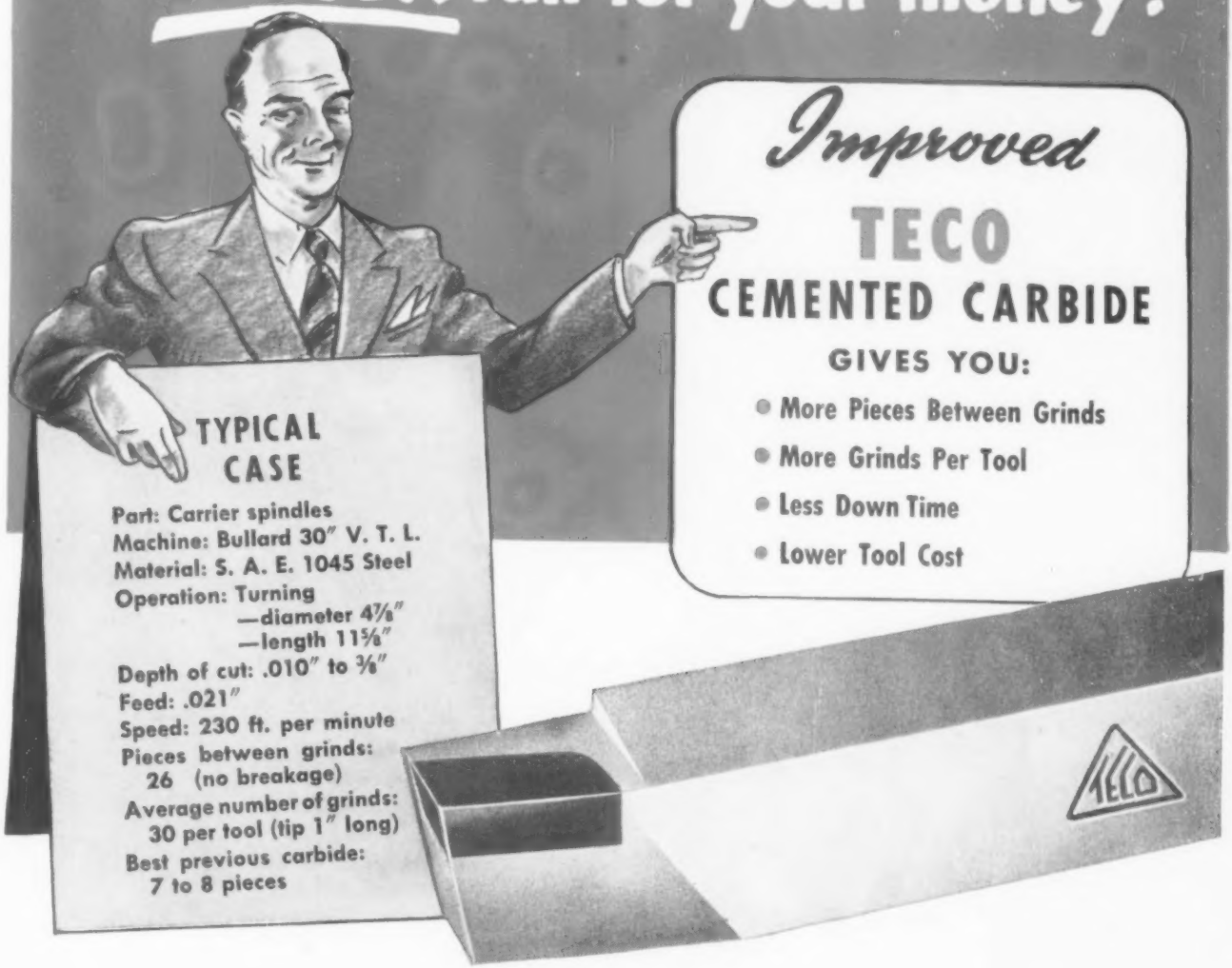
DETROIT	TR 2-5150
INDIANAPOLIS	LI 3884
MINNEAPOLIS	AT 5264
DAYTON	HE 3042
TOLEDO	GA 5706
SEATTLE	SE 2090
PORTLAND, Ore.	AT 1466
SAN FRANCISCO	MA 8532
BUFFALO	PA 9206
PHILADELPHIA	VIC 4084
ROCK ISLAND, Ill.	RI 743

DETROIT DIE SET CORPORATION

2895 W. GRAND BLVD. • DETROIT 2, MICH.

DETROIT DIE SETS ★

A LONGER run for your money!



It's easy to prove! Use a few tools with Improved TECO Cemented Carbide—on *any* carbide job. Run under identical conditions. Then check production and job-tooling cost against your present carbides. You will discover that improved TECO can be operated at higher speeds and feeds—gives more pieces per grind—more grinds per tool—longer tool life—and much lower tool costs.

The reason is found in our advanced metallurgical techniques, closely guarded by more rigid control methods at every step in manufacture. Result—an *improved* TECO Cemented Carbide — harder, tougher, more uniform in structure—more resistant to wear and breakage.

At your request, a TECO tool engineer will demonstrate. Or send us details of your set-up for proper recommendation. Write for latest catalog and price list.

TUNGSTEN ELECTRIC CORPORATION
570 39th Street, UNION CITY, N. J.
Branch Office: 403 Western Reserve Bldg., Cleveland 13, Ohio
Representatives: Indianapolis, Ind., Detroit, Mich.

Improved
TECO
CEMENTED CARBIDE

DRILL JIG

BUSHINGS

All A.S.A. STANDARD types and sizes in stock for immediate delivery.

Excellent delivery on NEW GAGES and GAGES salvaged by HARD CHROMIUM PLATING.

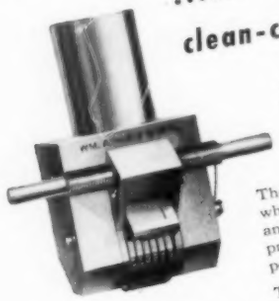
Write today for particulars

ECONOMY TOOL & MACHINE CO.

MILWAUKEE 14, WISCONSIN

FORCE AUTOMATIC NUMBERING HEAD

...for sharp, clean-cut indenting



The Force Model 23 Numbering Head does a precision job of indenting on metal and other materials.

The deeply-engraved figure wheels cut numbers cleanly and legibly in a simple hand press or the heaviest kind of power press.

The Force Numbering Head has a *full stroke swing* . . . *hub-type wheels, heavy duty case, oversized ratchets and pawls.* These special Force features make the numbering head reliable and long-lasting under the severest conditions.

Lever action for either consecutive or repeat. Regularly made with 6 or 7 wheels with Gothic or Roman numerals.

Write us for size and price information.

WM. A. FORCE & CO.
INCORPORATED
107 WORTH STREET, NEW YORK 13, N. Y.
3000 WEST CHICAGO AVENUE, CHICAGO 22, ILL.
682 MISSION STREET, SAN FRANCISCO 5, CAL.
Canadian Rep.: W. H. Harrison, Ste. Anne de Bellevue, Que.

NOW... YOU CAN USE SHORT PIECES OF SCRAP TOOL BITS AS REPLACEMENT CUTTERS

Insert in bar.
Complete cutter bar and insert showing cutting edge.
The micrometer dial of the insert has 25 graduations, each being one-thousandths of an inch.

Write at once for complete descriptive bulletins.

Quick, enthusiastic acceptance was received for this new time and money-saving boring-bar insert. It has many advantages found in no other insert.

NASH-ZEMPEL
BORING-BAR INSERT

It is unnecessary for you to come to us for cutter replacements. Cutters can be made in your own shop from scrap bits of hi-speed steel. No special tools necessary. Only a simple grinding operation required.

The insert can be installed in any bar available by a simple boring and milling operation. The locating head of the boring-bar insert fits snugly into the recessed slot of the bar. The set screw in the boring bar locates the insert and draws the head firmly against the shoulder of the recessed slot in the bar. Accurate location point is always maintained. *The Nash-Zempel boring-bar insert is available in forty standard sizes, with special sizes on request.*

NASH-ZEMPEL TOOLS

Division of J. M. Nash Company

2384 NORTH 30TH STREET • MILWAUKEE 10, WISCONSIN

1500 P.S.I.

OPERATING PRESSURE

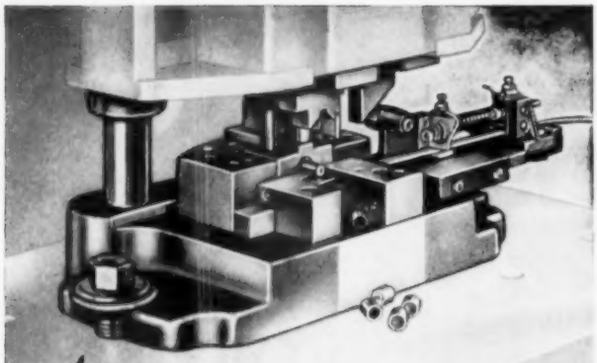
with the new, improved

GEROTOR "QH" HYDRAULIC PUMP

Gerotor announces the basically new "QH" hydraulic pump... offering decidedly bigger advantages, better design. Delivers pressures up to 1500 p. s. i. intermittently . . . 1200 p. s. i. continuously. Four sizes . . . with capacities of 3, 5, 8 and 12 g. p. m. . . . available now! Write for folder giving all the facts you need.

GEROTOR

GEROTOR MAY CORPORATION
BALTIMORE 3, MARYLAND



for

PEACETIME PROFITS

With Dickerman Hitch Feeds for your punch presses, you'll get top production at rock-bottom cost. They are accurate, reliable and easily changed from one die to another. Send now for descriptive booklet.

DICKERMAN HITCH FEEDS

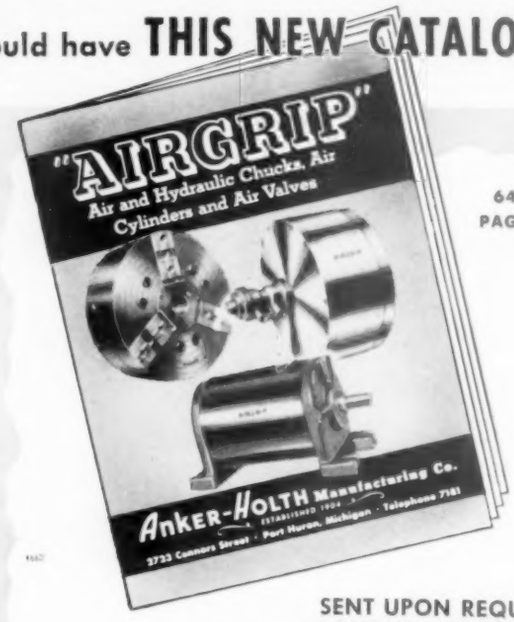
MANUFACTURED BY

H. E. DICKERMAN MFG. CO.

321E Albany St., Springfield 9, Mass.

EVERY TOOL ENGINEER

Should have **THIS NEW CATALOG**


"AIRGRIP"
Air and Hydraulic Chucks, Air Cylinders and Air Valves
ANKER-HOLTH Manufacturing Co.
2733 Connors Street · Port Huron, Michigan · Telephone 7181

64 PAGES

SENT UPON REQUEST
—CONTAINS ESSENTIAL
DESIGN DATA ON AIR CYLINDERS
and AIR or HYDRAULIC CHUCKS, etc.

ANKER-HOLTH MFG. CO.

2733 CONNORS STREET PORT HURON, MICHIGAN

A WHOLE SHOPFULL OF TOOLS IN ONE

Exclusive finger-grip brings hand closer for finer work

Complete with 35 accessories in fitted steel case

$22.50

$31.75 value if purchased separately

CASCO Electri-Craft Tool Kit

CASCO PRODUCTS CORPORATION • BRIDGEPORT 2, CONN.

4 TOOL CHANGES but NO TIME LOST on this ENGINE LATHE

Colwell Turrets AS LOW AS $36

Here's a job that called for 4 operations . . . turning, necking, threading and cutting-off. It was easily handled on a production basis on a lathe with a Colwell turret. No time lost in changing tools, for once the job was set up, changing from one tool to the next, was only a matter of seconds. Colwell turrets are inexpensive, accurate and ruggedly built. Sizes to fit most lathes. Write for catalog.

S. G. COLWELL

25 Congress Ave.

Providence, R.I.

BESLY TAPS go nautical...

WITH JOHNSON "SEA HORSES"

Profitable Facts For Tap Users

This handy booklet offers useful information on taps and tapping procedures. It's written by shop men for shop men. Tap fits and drill sizes are listed in detail. Write today on your own letterhead for your copy—free.

In the production of Johnson's famous "Sea Horse" Outboard Motors, Besly Taps contribute to smooth, flowing power and sturdy endurance by precision threading of many component parts.

Ashore or afloat—*for more than 50 years*—threads cut by Besly Taps have aided top performance and functional dependability for machinery, equipment and other products from hundreds of America's leading industries.

Ask your distributor about Besly Taps and Besly Tap engineering service.

BESLY

BESLY TAPS • BESLY TITAN ABRASIVE WHEELS
BESLY GRINDERS AND ACCESSORIES

CHAS. H. BESLY & COMPANY, 118-124 N. Clinton St., Chicago 6, Illinois • Factory: Beloit, Wis.

Darwin

PRK-33

COBALTCROM

Air-Hardening, Non-Deforming, Cobalt High-Carbon, High Chromium Steel

A steel for blanking, forming, drawing, trimming and shearing tools. Recognized as the leader in its field, PRK-33 has extremely long life in dies and is unsurpassed on quantity production runs. Simple to heat treat with uniform hardness penetration to the center and secondary hardness. Has high tensile strength and great resistance to abrasion.

FURNISHED IN BAR STOCK, BILLET, FORGING, CASTING AND WELDING ROD. BULLETIN ON REQUEST

Representatives in New York City, Plainville, Philadelphia, Pittsburgh, Detroit, Orlando, Chicago, Indianapolis, Milwaukee, St. Louis and Los Angeles.

DARWIN & MILNER Inc.

highest grade tool steels

1260 W. FOURTH ST. CLEVELAND 13, OHIO

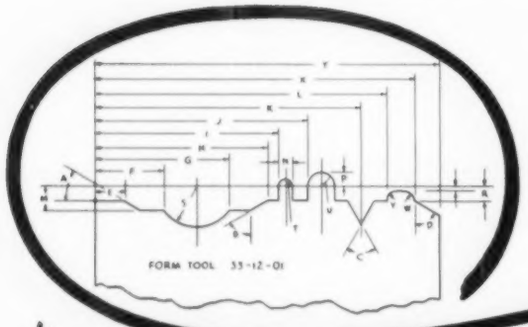
ARMSTRONG

"C" CLAMPS ARE ALL DROP FORGED

For "C" Clamps that never spread, that never spring or loosen...for unequalled stiffness, strength, and holding power... for years of dependable service, for the finest clamps made, specify ARMSTRONG "C" Clamps.

ARMSTRONG "C" Clamps in design, steels, heat treating, and accuracy of machining are high quality tools. Screws are of special analysis steel with close fitting thread, hardened points of free-action swivel. They are handier and absolutely dependable. Standardize on ARMSTRONG Drop Forged "C" Clamps.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
357 N. FRANCISCO AVENUE
Chicago 12 U. S. A.
EASTERN WAREHOUSE AND SALES:
199 Lafayette St., New York 12, N. Y.
PACIFIC WHSE. AND SALES OFFICE:
1275 Mission St., San Francisco 3, Calif.



SAVE TIME AND COMPUTATIONS

..MEASURE TOOL CONTOURS DIRECTLY

WITH THE BAUSCH & LOMB

CONTOUR MEASURING PROJECTOR

IT PROJECTS a sharp, distinct, geometrically true, magnified silhouette of the object on a protractor screen where all angular measurements can be read to ±1 minute of arc (1′)—an accuracy not attainable with any other projector. Direct linear measurements, reading to ±.0001″, may be made by means of the cross slide stage with its attachments.

Dimensions, angles, and profiles of production-run parts can be compared directly with a traced outline of the projected image of the master part, or with a large scale drawing superimposed on the screen. Defects are located quickly and simply.

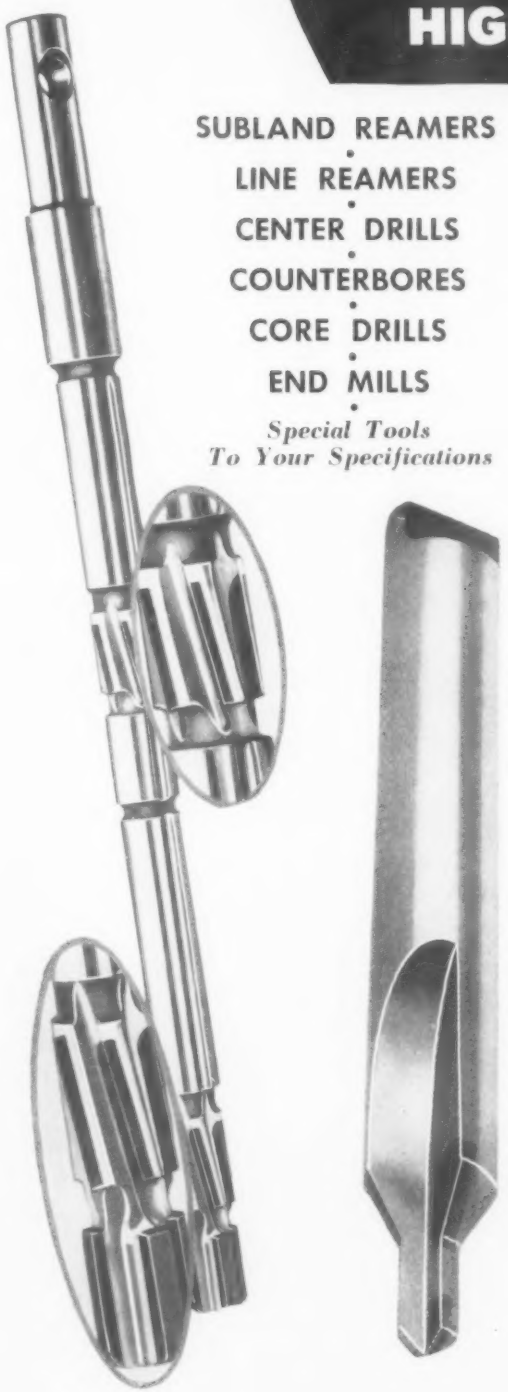
Write for Catalog D-27. Bausch & Lomb Optical Co., 763-12 St. Paul Street, Rochester 2, New York.

BAUSCH & LOMB

OPTICAL COMPANY ROCHESTER 2, N.Y.

Now!

CARBIDE-TIPPED TOOLS
BRAZED ON HARDENED
HIGH-SPEED STEEL BODIES



SUBLAND REAMERS
•
LINE REAMERS
•
CENTER DRILLS
•
COUNTERBORES
•
CORE DRILLS
•
END MILLS
•
Special Tools
To Your Specifications

AGAIN, Detroit Reamer & Tool Company sets the pace in metal cutting tools, with brazed carbide tips on hardened high-speed steel bodies, so that the total length of the flutes and pilots will Rockwell C-62-63.

It has also been proven in actual practice that this type of tool has a higher cutting efficiency due to the harder background for the carbide tips which produces less "spring-back" under heavy cuts for this same reason. Also, the flutes and pilots will not "score" or pick up due to the hardness of the high-speed steel and long wear on the pilot.

All of these outstanding advantages, together with longer tool life and reduced production costs, are at your disposal with Carbide Tipped Cutting Tools, with HIGH-SPEED STEEL BODIES.

• MADE TO YOUR SPECIFICATIONS •

Write for QUOTATION

DETROIT REAMER & TOOL CO.

2830 E. Seven Mile Road **Detroit 12, Michigan**

Manufacturers of Oil-Hole Drills, Subland Drills, Special Reamers, Circularity Relieved Reamers, End Mills and Special Tools

IT PAYS TO KNOW
Your KENNAMETAL GRADES!

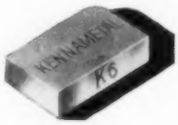
Most crater-resistant Kennametal tool material—gives outstanding service for finishing or moderate cuts on carbon and alloy steels .30% carbon and higher. Also time-and money-saver for general use on soft steels containing less than .30% carbon, precision boring of steel where .004" feed or over is used, and for many milling jobs on steel. 92 Rockwell A hardness.

The hardest Kennametal tool material grade—specifically for solid tools used on precision boring of steel parts. Its high hardness, great resistance to cratering, and unusual strength can help you cut costs where fast, accurate work is essential. 93.2 Rockwell A hardness.

Strongest crater-resistant Kennametal tool material—saves tooling and production costs when taking rough cuts on carbon and alloy steel forgings, bar stock, etc., having carbon content of .30% and higher. Also outstanding for milling of steel at heavy chip loads. 91 Rockwell A hardness.

A very strong Kennametal tool material, particularly suitable for roughing cuts on steel castings. Its high resistance to abrasion and edge wear of sand inclusions makes possible exceptionally high rate production, and economical tooling costs. 91.5 Rockwell A hardness.

Highly resistant to edge wear—takes a good edge—a money-saving tool material for very light finishing cuts on steel and for precision boring with less than .004" feed. Ideally suited for tools requiring large nose radius or where tool must dwell without cutting. Excellent for milling, and very rough cutting of brass, bronze, and aluminum alloys. 92.3 Rockwell A hardness.



Reduces cost of machining cast iron. Extremely hard, straight tungsten carbide tool material having unusual strength. Holds a keen edge, withstanding shock of interrupted cuts on rough, sandy, or chilled castings. Also outstanding for finishing and precision boring of cast iron. 92.2 Rockwell A hardness.

Catalog 46 has complete information. Send for it

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
KENNAMETAL Inc., LATROBE, PA

DE-STA-CO MODEL NO. 620
Reverse Action-Plunger Type

A new, versatile, plunger type clamp, designed to assure positive parallel clamping action during welding, drilling, assembly or milling operations. Excellent for quick-action and the locking of work in jigs and fixtures.

Plunger rod is tapped to receive 3/8"—16 bolt for adjusting. Reverse action permits operating ease in congested areas and where working height is limited.

Available from our distributors in the U.S.A. and Canada.

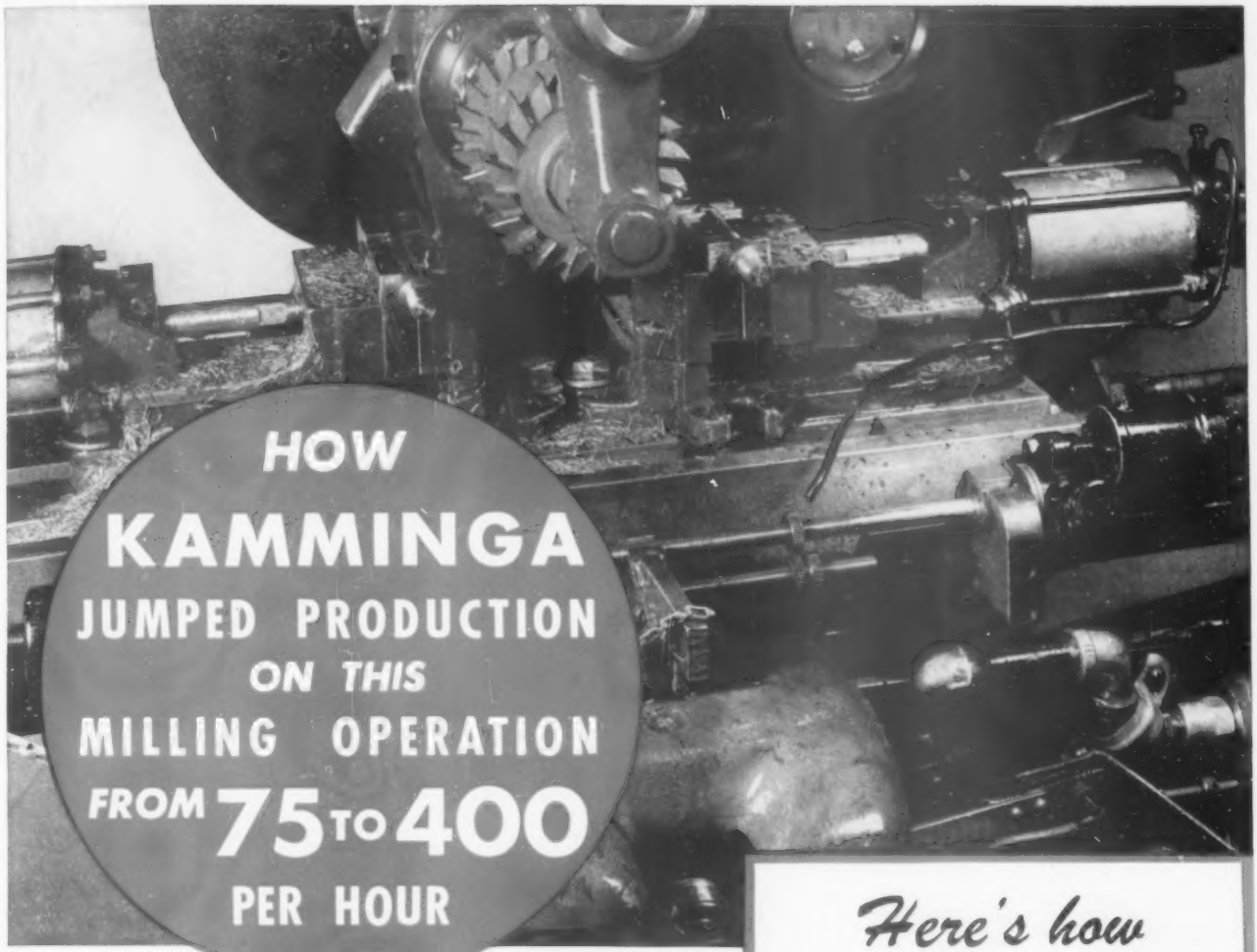
Write today for catalog No. 47

DETROIT STAMPING CO.
Established Over 30 Years
328 Midland Ave • Detroit 3, Mich.

Columbia
TOOL STEEL

COLUMBIA SPECIAL
Highest Grade
Water Hardening Tool
Steel
Best for
Carbon Steel Dies and Cutters. Unexcelled for Cutting and Forming plastics, fibers, paper, and non-ferrous metals.
It pays to use Good Tool Steel

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. CLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
520 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.



HOW KAMMINGA JUMPED PRODUCTION ON THIS MILLING OPERATION FROM 75 TO 400 PER HOUR

Milling of this anchor pin in the plant of the Kamminga Manufacturing Co., Grand Rapids, had been handled by hand clamping, and hand milling one end at a time. After milling one end, the operation was repeated for the other end. Production averaged 75 complete pieces per hour — 600 per 8-hour shift.

A Bellows Senacon Field Engineer recalled a somewhat similar operation described in one of the Bellows Senacon Foto Facts Files. Working with Kamminga production men they converted a standard Nichols hand mill into a fully automatic unit — a unit that jumped production 533% — from 600 to 3200 complete pieces per shift — increased cutter life 300% — and cut labor costs per piece more than 80%.

The production increase obtained by Kamminga Manufacturing Co. is not unusual. Production increases ranging between 40% and 500% are obtained wherever manual feeding and clamping on milling machines, drill presses or other machine tools is replaced with Bellows Senacon "controlled-air" power.

Here's how IT WAS DONE

A Bellows Senacon "continuous action" Air Motor was installed to traverse the bed against two opposed Bellows Senacon Hydro-Checks (hydraulic resistance units). Two Bellows Senacon Air Vises, synchronized to open and close automatically, were set up to hold the part. The operator loads one vise while a second part is under the cutter. Once the unit is started all operations, except loading and unloading, are continuous and automatic.

Bellows Senacon Co.

AKRON 10, OHIO

Would you like the current Foto Facts File without cost or obligation? *Send coupon, today.*

Please send me the current Bellows Senacon Foto Facts File, and the detailed story of the milling operation described in the December issue of The Tool Engineer.

Name .....

Company .....

Address .....

The ECLIPSE 2-PIECE CORE DRILL

★ EASILY INTERCHANGEABLE
★ ECONOMICAL
★ EFFICIENT

● If you require a tool for enlarging and boring cored holes in castings and forgings—or for bushing guided operations—you'll want the facts about the proven Eclipse 2-Piece Core Drill!

● Its performance is tops and its features many. When the HSS core drill tip is worn or dulled, it is easily and quickly replaced. The holder maintains its original size throughout the life of many core drill tips. It has the rigidity of a one piece drill. And it's available in both standard sizes and special diameters and lengths. Write today for details.

To remove a drill tip that is worn or dulled, a key drift quickly and easily ejects the tip or cutter for a new replacement. Tips with carbide or other alloys are obtainable.

ECLIPSE COUNTERBORE CO.
Founded thirty years ago
DETROIT 20, MICHIGAN

Billets cut off to *exact* size

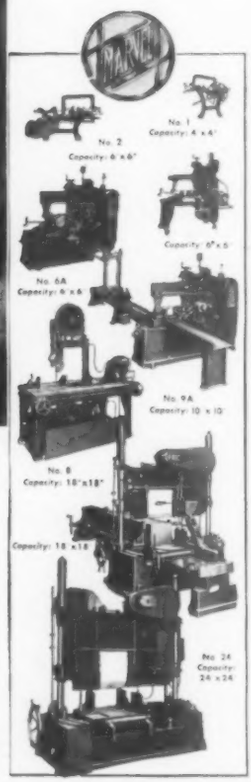
Any Quantity Cut-off automatically

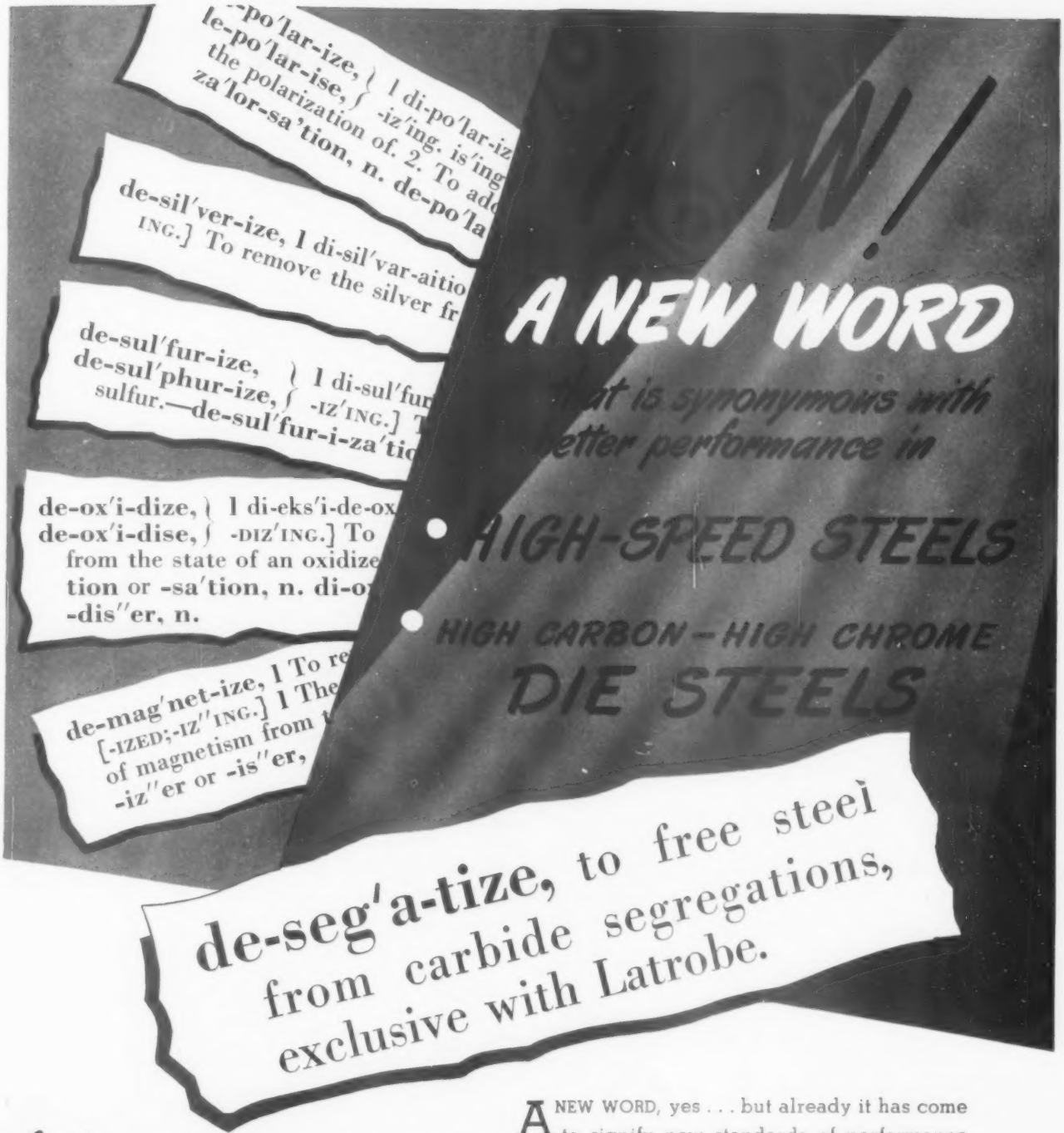
These MARVEL Saws are money makers for this modern forge shop in many ways. (1st) they cut-off billets for a small fraction of the cost of cutting-off with a hammer. (2nd) these billets are so accurate in size that they exactly fill the dies with no excess fin, not only simplifying trimming and finishing, but getting extra billets from many bars. (3rd) they keep all hammers busy on *production* work for these "world's fastest" saws can keep ahead of any schedule. (4th) they reduce cutting-off labor costs to an absolute minimum. It takes only one operator and a helper to keep all of these saws running because all but the No. 18 Giant Hydraulic Saw (at the right) are *automatic*—feed measure, and cut-off identical billets; requiring no more attention than automatic screw machines.

Your local MARVEL Sawing Engineer will gladly call and explain how you can add these five extra profits to your forge operation.

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 Bloomingdale Ave. ● Chicago 39, U.S.A.
Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS




A NEW WORD
• HIGH-SPEED STEELS
• HIGH CARBON–HIGH CHROME DIE STEELS
de-seg'a-tize, to free steel from carbide segregations, exclusive with Latrobe.

Ask for portable demonstration!

We will gladly furnish a portable demonstration of the difference between ordinary steels and Latrobe DESEGATIZED Steels at your convenience. Write.

LATROBE DESEGATIZED STEELS

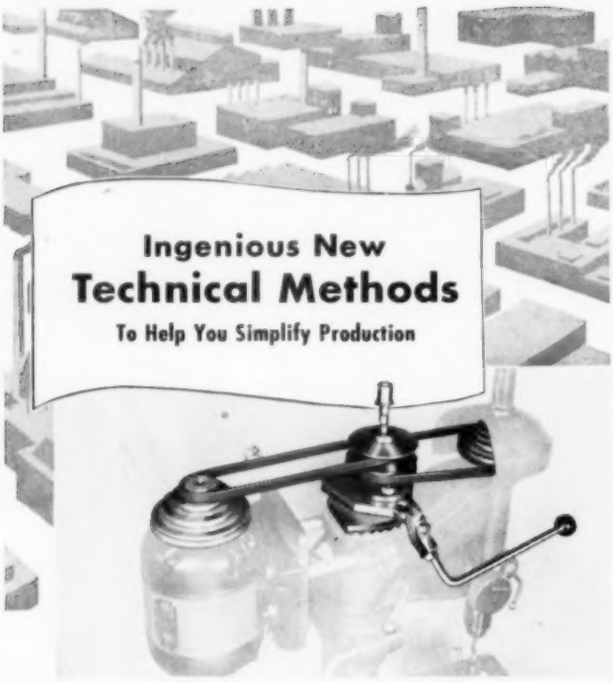
A NEW WORD, yes . . . but already it has come to signify new standards of performance in High Speed Tool Steels and now in High-Carbon High-Chrome Die Steels!

Latrobe's exclusive process of *desegatizing* makes all these steels *free from the usual carbide segregations.*

•

This revolutionary new process is now available for Die Steels as well as High-Speed Steels. Ask for Bulletins on the steels that interest you—full of useful technical information and illustrated with photographs and photomicrographs.

LATROBE ELECTRIC STEEL COMPANY * LATROBE, PENNSYLVANIA



Variable Speed Drive Attachment Offers Instant Speed Control for Drill Press Work!

Now you can adjust drill press speeds from high to low—or any intermediate speed—as easily as shifting gears in your car! The Era Variable Speed Drive Attachment enables the operator to provide the correct speed for large or small drills by merely moving a lever. This saving in time results in greater work volume, better work, and lower production cost.

Era Variable Speed Drive

The Era Attachment fits all popular makes of drill presses, and is easily installed without the necessity of drilling holes or changing present equipment.

To also help save time on the job, many plant owners make chewing gum available to workers. Chewing gum seems to make work go easier, time go faster. Wrigley's Spearmint Gum may be used even when both hands are busy, eliminating work interruptions, and thus promoting greater safety for the operator.

You can get complete information from Era Meter Co. 3940 N. Kilpatrick Ave., Chicago 41, Ill.

AA-204

TO ANSWER

your every **marking** *need is our objective*

MATTHEWS MARKING DEVICES

For nearly a century Jas. H. Matthews & Co. have been making marking devices to meet every requirement. From simple hand stamps to complex marking machines Matthews has a marking device that will answer your needs . . . economically, attractively and distinctively.

For complete information about our many marking devices write or phone our nearest plant or sales office listed below.

JAS. H. MATTHEWS & CO.

3923 FORBES STREET PITTSBURGH 13, PA.

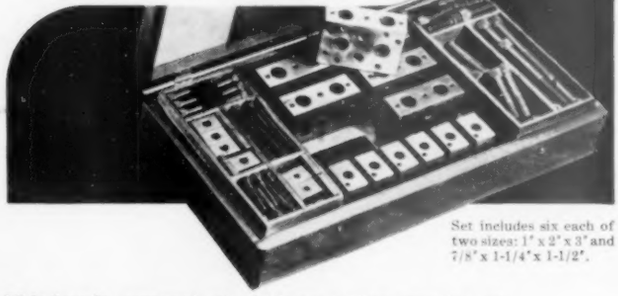
BRANCH PLANTS

NEW YORK, BOSTON, CHICAGO, PHILADELPHIA, NEWARK, SYRACUSE

District Sales Offices: Cleveland, Cincinnati, Birmingham

Something new in 3-way Parallel Set-Up Blocks

One Handy Set Speeds Set-ups To 12 Different Heights



Set includes six each of two sizes: 1" x 2" x 3" and 7/8" x 1-1/4" x 1-1/2".

This handy, compact set of Moore 3-Way Parallel Set-up Blocks takes the place of a large number of conventional parallels. Each block may be used in any of its three dimensions to build up to 12 different heights.

Spaced *around* the work-piece to provide support, parallel or perpendicular to working surfaces, they eliminate sagging, localize stresses and hold work rigidly throughout the machining operation. And they may be placed to avoid interference with holes being bored or ground.

Moore 3-Way Parallel Set-up Blocks are carburized chrome-nickel steel, finish-ground to +.0002"–.0000". Sides are parallel within .0001", perpendicular within .0002". Write for descriptive literature.

Moore Special Tool Company, Inc., 732 Union Ave., Bridgeport 7, Conn.

MOORE TOOLS

MANUFACTURERS OF MOORE JIG BORER AND MOORE JIG GRINDER

This

BLUE CHIP

High Speed Steel Die

Lives Up to its Name!

- **produces 75,000 pieces per grind**
- **has a life of 8,000,000 pieces**
- **furnishes blanks free from burrs**

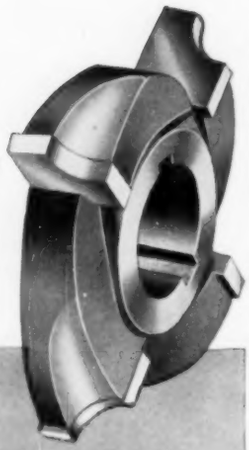
The remarkable performance records being made by this Blue Chip Blanking Die for motor laminations are typical of Firth-Sterling quality and precision. What is your die problem?

Call **Firth-Sterling**

STEEL COMPANY

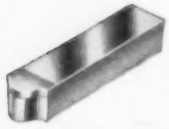
McKEESPORT, PA. · NEW YORK · HARTFORD · PHILADELPHIA · PITTSBURGH · CLEVELAND · DAYTON · DETROIT · CHICAGO · LOS ANGELES

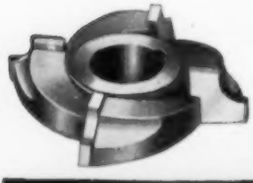
For FASTER
SMOOTHER CUTTING,
LONGER LIFE and
BETTER FINISH—



Meyers

Carbide Tipped FORM TOOLS



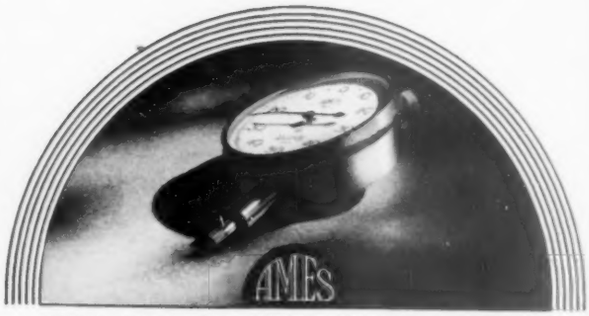


The Meyers method of generating carbide-tipped tools insures the accuracy of each radius. On milling cutters all teeth are precisely uniform, thereby distributing the work evenly over the entire cutter. This accuracy and uniformity increases the life of the tool amazingly, and insures a much better finish on the work.

We are equipped to grind tools to your specifications, and to engineer special tools for your particular job. Write for complete information, or send us your prints for a quotation.

W. F. MEYERS CO., INC.
ESTABLISHED 1888

1024 44th Street *Bedford, Indiana*



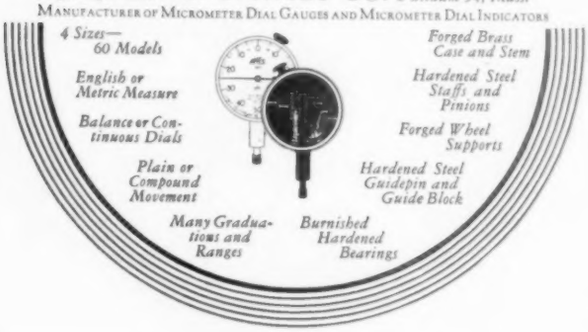
GOOD IN THE 4TH DIMENSION, TOO!

For tool checking or tough production jobs, Ames Dial Indicators are *time*-conserving as well as sensitive and accurate. They're *quickly* mounted and adjusted. Their dials are *instantly* readable. But *most time-saving* is their ability to stay *right* on the job, without internal adjustment—*longer* than any other indicator you can buy. Send for illustrated Catalogue.

Representatives in principal cities

B. C. AMES CO. *30 Ames Street Waltham 54, Mass.*

MANUFACTURER OF MICROMETER DIAL GAUGES AND MICROMETER DIAL INDICATORS



DRILL JIG BUSHINGS

Accurate

Interchangeable

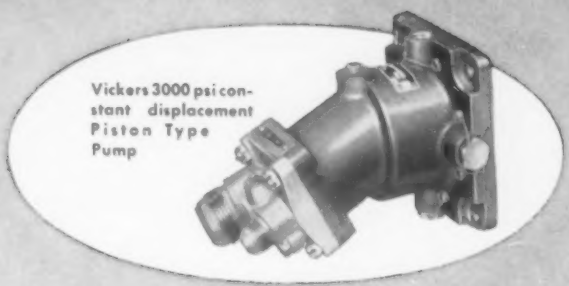
Acme
Industrial
Company

200 N. LAFLIN ST.
CHICAGO 7, ILLINOIS

Concentric

WRITE FOR FREE CATALOG!

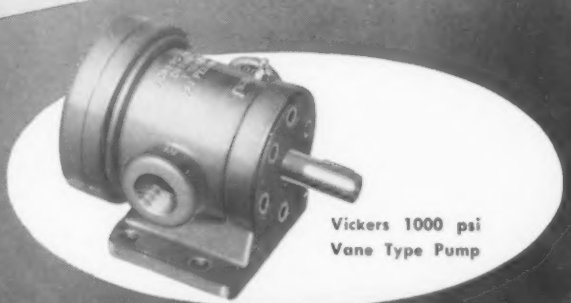
VICKERS Hydraulic Pumps



Vickers 3000 psi constant displacement Piston Type Pump

HIGH IN THE SKY to DEEP IN THE EARTH

Reliability with minimum weight . . . greater safety and longer life . . . are among the exacting requirements of the airlines. It is significant to designers and users of many other types of equipment that Vickers Hydraulic Pumps and Controls are widely used in the 3000 psi hydraulic systems of these huge planes that are literally writing new pages in aviation history.



Vickers 1000 psi Vane Type Pump

Huge cutting machines depend upon Vickers Hydraulic Pumps and Controls to speed the work and reduce the cost of mining coal. The operator controls the massive machine more easily than you drive your car.

Between these extremes, Vickers Hydraulic Equipment is serving industry in countless ways . . . wherever accurate, dependable and easy control is needed. In addition to the thousands of more widely known applications on metal working machinery, Vickers Hydraulic Pumps and Controls are used on construction equipment, motor buses, printing presses, agricultural machinery, marine equipment, oil well pumping units, textile and paper machinery, trucks, etc. Vickers Application Engineers will be glad to discuss with you how hydraulics can be used to your advantage.

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

VICKERS Incorporated

Application Engineering Offices: ATLANTA ★ CHICAGO ★ CINCINNATI ★ CLEVELAND ★ DETROIT ★ LOS ANGELES
NEWARK ★ PHILADELPHIA ★ ROCHESTER ★ ROCKFORD ★ SEATTLE ★ TULSA ★ WORCESTER

Index of Tool Engineer Advertisers

December 1946

A

Acme Industrial Company 156
Edward C. Kennedy
Acme Tool Company 142
Diener & Dorskind, Inc.
American Chain & Cable Co. 94
Andrew C. Campbell Div.
Reincke-Meyer & Finn, Inc.
B. C. Ames Company 156
Henry A. Loudon Advertising
Anker-Holth Mfg. Co. 146
Van Auken & Ragland
Armstrong-Blum Mfg. Co. 152
Ross Llewellyn Advertising
Armstrong Bros. Tool Company 148
Ross Llewellyn Advertising

B

The Baird Machine Co. 88
Baker Brothers, Inc. 105
Bausch & Lomb Optical Company 148
Ed. Wolff & Associates
Bay State Abrasive Products Co. 96
Howard-Wesson Co.
The Bellows Senacon Company 151
Ralph Gross Advertising
Charles H. Besly & Co. 147
Evans Assocs., Inc.
Bethlehem Steel Company, Inc. 97
Jones & Brakeley, Inc.
Brown & Sharpe Mfg. Co. 89
Horton-Noyes Company

C

Carboloy Company, Inc. 98
The Carborundum Co. 141
Addison Vars Co.
Casco Products Corp. 146
Grey Advertising Agency, Inc.
Cleveland Twist Drill Company 125
Belden and Hickox
Columbia Tool Steel Company 150
R. J. Skala Co.
S. G. Colwell 146
The Smith-Follett Co., Inc.
Cosa Corporation 131
Crobalt, Inc. 109
Charles Schweim Company
M. E. Cunningham Company 88
Walker & Downing
Cushman Chuck Company 106
Edward W. Robotham & Company

D

Danly Machine Specialties, Inc. 135
Behel & Waldie & Briggs, Inc.
Darwin and Milner, Inc. 148
Brad, Wright, Smith
Detroit Broach Company 113
Charles M. Gray & Associates
Detroit Die Set Corporation 142
Wolfe-Jickling-Dow & Conkey, Inc.
Detroit Reamer & Tool Company 149
Dudgeon, Taylor & Bruske, Inc.
Detroit Stamping Company 150
Charles Schweim Co.
Detroit Tap & Tool Co. 100
Denham and Company
H. E. Dickerman Mfg. Co. 146

E

Eclipse Counterbore Company 152
Economy Tool & Machine Co. 144
Ex-Cell-O Corp. 159
Holden-Clifford-Flint, Inc.

F

Firth-Sterling Steel Company 153
Ketchum-MacLeod & Grove, Inc.
Wm. A. Force & Co., Inc. 144
Wendell P. Colton Co.

G

The Gammons-Hoaglund Co. 140
General Riveters, Inc. 134
Baldwin, Bowers & Strachan, Inc.
Gerotor May Corp. 145
The S. A. Levyne Co.
Giddings & Lewis Machine Tool Co. ..... 6 & 7
The Cramer-Krasselt Co.

G

Glern & Anholtt Tool Company 140
Chas. Schweim Co., Advertising
Gisholt Machine Company ..... 90 & 91, 108
The Buchen Company
George Gorton Machine Company 128
The Cramer-Krasselt Co.
Govro-Nelson Co. 136
Dudgeon, Taylor & Bruske, Inc.
Greenfield Tap & Die Corp. 121
Channing L. Bete Co.
Grob Brothers 136

H

Hammond Machinery Builders, Inc. 132
Crescent Advertising Service
Hardinge Brothers, Inc. 3
Taylor Ward, Inc.
Haynes Stellite Company 116
J. M. Mathes, Inc.
The Heald Machine Company 93
Rickard & Company, Inc.
The Holo-Krome Screw Corp. 160
R. H. Young & Associates

I

Illinois Tool Works 139
Behel and Waldie and Briggs, Inc.

K

Kennametal Inc. 150
W. S. Hill Company
Kingsbury Machine Tool Corporation 107
Henry A. Loudon, Advertising

L

Landis Machine Company 118
Langsdale Advertising
Latrobe Electric Steel Company 153
The Advtg. Agency of Wm. Cohen
H. Leach Machinery Co., Inc. 112
Joseph Maxfield Company
R. K. LeBlond Machine Tool Co. ..... Back Cover
Perry-Brown, Inc.
Lepel High Frequency Laboratories, Inc. 117
G. M. Basford Co.
Lipe-Rollway Corp. 137
Barlow Advertising Agency, Inc.

M

Majestic Tool & Mfg. Co. 124
Jas. H. Matthews & Company 154
Cabot & Co., Inc.
W. F. Meyers Company, Inc. 156
The Caldwell-Baker Company
Michigan Broach Company 104
Burke-Bartlett Company
Michigan Tool Co. 102
Denham and Company
Moore Special Tool Co., Inc. 154
Fred Wittner Advertising
Morse Twist Drill & Mach. Company ..... 10 & 11
Sutherland-Abbott

N

J. M. Nash Company 144
Nash Zempel Tool Div.
The Cramer-Krasselt Co.
National Broach and Machine Company 111
Witte & Burden, Advertising
National Tool Salvage Co. 132
Burke Bartlett Company
New Britain Machine Co. ..... Inside Back Cover
Wilson, Height & Welch, Inc.
Norton Company 101
John W. Odlin Co., Inc.

O

O. K. Tool Company ..... 14 & 15
Claude Schaffner Advertising Agency
Olofssen Tool & Die Co. 129
Creative Agency Assocs.
O'Neil-Irwin Mfg. Co. 130
Foulke Agency

P

Park Chemical Company 99
Marvin Hahn Advertising
Pioneer Pump & Mfg. Co. 136
St. Claire Advertising Agency
Pope Machinery Corp. 115
Walter B. Snow & Staff, Inc.
Potter & Johnston Machine Co. 103
Pratt & Whitney ..... Inside Front Cover
Wm. B. Remington, Inc.

Q

Quaker Chemical Products Corp. 16
R. E. Lovekin Corporation

R

Reed Small Tool Works 130
Lewis Advertising Agency
Republic Gage Company 134
Burke Bartlett Company

S

Screw Machine Tool Company 114
St. Claire Advertising Agency
The Sheffield Corporation 4
Witte & Burden
Sheldon Machine Company, Inc. 120
Ross Llewellyn Inc., Advertising
Shell Oil Co., Inc. 2
J. Walter Thompson Company
Simonds Saw & Steel Co. 119
Sutherland-Abbott
Size Control Company 110
Advertising Producers-Associated
Standard Gage Co., Inc. 5
Hevenor Advertising Agency, Inc.
Standard Machinery Co. 130
Hammond-Goff Co.
L. S. Starrett Company 12
Walter B. Snow & Staff, Inc.
Stokerunit Corporation 133
Super Tool Company 9
Wolfe, Jickling, Dow & Conkey, Inc.
Swartz Tool Products Co. 132

T

Thriftmaster Products Division 122
Thomson Industries, Inc.
The Kotula Company
Tungsten Electric Corp. 143
Thoma & Gill
Tungtip Tools Div. Lowell & Grayson 122

U

U. S. Drill Head Co. 88
Universal Engineering Co. 123
Seemann & Peters, Inc.

V

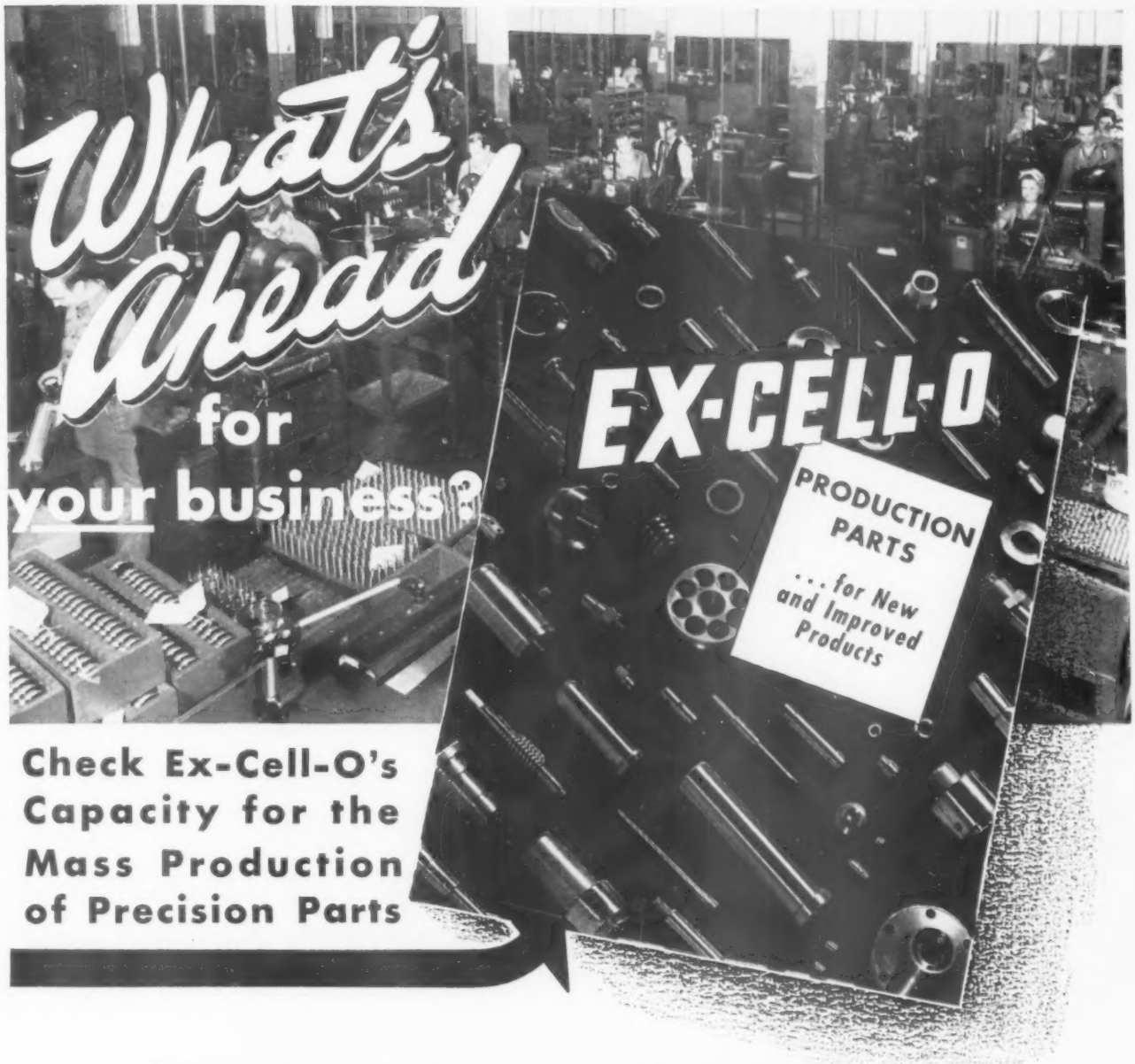
Vickers, Inc. 157
Witte & Burden

W

War Assets Administration ..... 126 & 127, 138
Fuller & Smith & Ross, Inc.
Warren City Manufacturing Co. 95
McClure & Wilder, Inc.
S. B. Whistler & Sons 13
Addison Vars Company
Wilson Mechanical Instrument Co. Inc. 122
Reincke, Meyer & Finn
Winter Brothers Company 92
Ad-Service, Inc.
Wm. Wrigley Jr. Company 154
Ruthrauff & Ryan, Inc.

Z

W. M. Ziegler Tool Co. 140
Dudgeon, Taylor & Bruske, Inc.



Check Ex-Cell-O's Capacity for the Mass Production of Precision Parts

With a complete organization under one responsible management . . . *an organization built upon years of varied engineering experience, modern machining methods and heat treat facilities, and practical inspection staffs* . . . Ex-Cell-O probably has the exact solution to the parts production problem you face. The above folder illustrating Ex-Cell-O's complete parts production facilities will be sent you upon request. Write or wire Ex-Cell-O today and ask for Ex-Cell-O Bulletin No. 36151.

XLO

EX-CELL-O *for* PRECISION

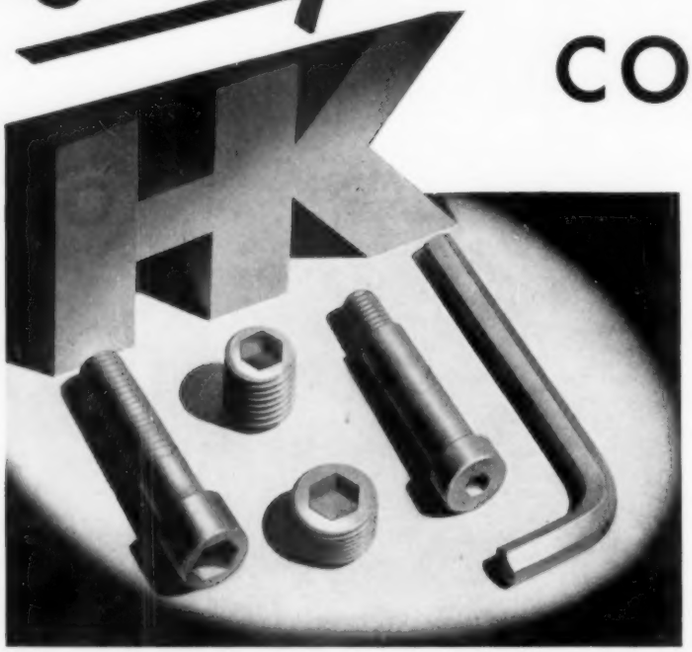
Send sketch, blueprint or sample of your part to Ex-Cell-O

EX-CELL-O CORPORATION

DETROIT 6, MICHIGAN

Completely

COLD FORGED



CAP • SET • PIPE PLUG • STRIPPER BOLT • KEY

SOCKET SCREWS

. . . exclusively HOLO-KROME

Savers of Weight, Space, Time

WEIGHT: Because of greater strength fewer screws are needed.

SPACE: Internal wrenching feature permits more compact design.

TIME: Quicker and more positive tightening especially in close corners and hard-to-get-at places.

Plus—the fact all Holo-Krome FIBRO FORGED Socket Screws are made of special analysis alloy steel scientifically heat treated to develop the utmost in strength . . . Every H-K Socket Screw Product is guaranteed to give Unfailing Performance.

HOLO-KROME

Your Holo-Krome Industrial Distributor is ready to serve you from his warehouse stock.

fibro forged

INTERNAL

SOCKET SCREWS

WRENCHING

THE HOLO-KROME SCREW CORP., HARTFORD 10, CONN.

PRODUCTION.

6 OPERATIONS
4.15 SECONDS PER PIECE
869 PIECES PER HOUR [AVERAGE]

New Britain Model 60 Multiple Spindle Automatic Screw Machine on which the part shown above is machined.

For more, better parts per hour this year and years from now, it pays to pick

NEW BRITAIN

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

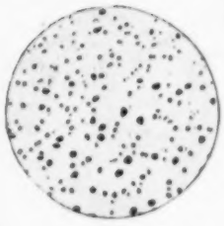
M-01051

Le Blond flame-hardened lathe bed ways

assure longer sustained accuracy!

THE RIGHT STEEL + LeBLOND FLAME-HARDENING PROCESS + COMPLETE STRESS-RELIEVING DRAW = LONGER SERVICE LIFE.

friction reducing



Graphite distribution of graphitic type steel used exclusively on all LeBlond flame hardened ways.

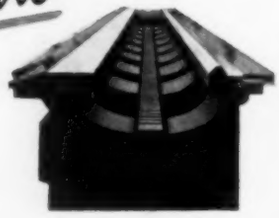
The graphitic type steel used in LeBlond flame hardened bed ways has qualities and properties equivalent to those of a high grade tool steel. The microscopic graphitic pockets, uniformly distributed throughout its structure, absorb oil, facilitating lubrication and greatly reducing friction and wear. The lubricant retained in the graphite recepticals makes carriage movement easy and accounts for the remarkable service life of the shears.

complete

After flame hardening, a stress-relieving draw is given all LeBlond bed ways to relieve the stresses set up by the hardening process. These shears test 63-66 Rockwell C (over 600 Brinell). They will outlast the useful life of the lathe. In addition, the LeBlond compensating vee-way principle is retained, supporting the carriage at a right angle to the thrust of the tools.

Cross section view. Note the uniform structure of the soft metal core, the generous depth of the hardened outer case.

replaceable



LeBlond flame hardened bed sections are joined to the bed by means of screws at intervals of six inches. It is easy to remove and replace them in the event of accidental damage.

standard equipment

LeBlond flame-hardened and ground shears are furnished as standard equipment on both front and rear ways of all heavy duty engine lathes up to and including the 32″ size, on all tool room lathes, and on all hollow spindle (oil country) lathes.

In addition to the bed ways, many other LeBlond lathe parts which are subject to wear are also flame-hardened. For example, on the 25″ heavy duty engine lathe, 13 separate parts . . . shafts, gears, pinions, and bars . . . are flame-hardened by the LeBlond process for greater sustained accuracy and longer life.

for further information, write

THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES